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ETHNOLOGY.—*Powhatan Algonkian bird names: The Aushouetta (Topsell) or the Ahshowcutters (Strachey)*: Richmondena cardinalis.[1] CHARLES EDGAR GILLIAM, Petersburg, Va. (Communicated by JOHN R. SWANTON.)

Bayard H. Christy, in an article in The Auk, July 1933, entitled *Topsell's 'Fowles of Heaven,'* suggests that the bird called Aushouetta by Topsell is the thrasher(?). John R. Swanton in *Newly discovered Powhatan bird names* (Jour. Washington Acad. Sci. 24 (2). Feb. 15, 1934), from an analogy to the Penobscot skunt·és, meaning "little fire" or "little flame," supplied by Speck, indicates the name Aushouetta refers to the redstart (*Setophaga ruticilla*), pointing out that in Cuba the redstart is called candelita for the same reason.

The European redstart is a quite similar bird, but belongs to the family Sylviidae. It is known in Spain as candelita, suggesting the Cuban usage is of Old World rather than native New World origin. Smith gives the Powhatan Algonkian for "fire" as Pokawater and for "little" the words tanks and chawopo. Such considerations cast some doubt upon the Penobscot analogy furnishing a reliable clue of identity in this instance.

No trained ornithologist is known to have been in this colony during the period covered by the manuscripts involved. Topsell is not known to have been in America. One may assume that his drawing was made from a description furnished by some layman, who actually saw the bird.

Among those in this colony about that time was William Strachey. He came with the announced intention of observing and recording. He landed at Jamestown on June 10, 1610, and was back in his lodgings at Greyfriars, London, long enough before December 13, 1611, to complete and register for publication on that date his little volume *Laws (for the Colony of Virginia)*. The important fact is that he was in Virginia and observed and recorded.

His few known manuscripts indicate that he was acquainted with many branches of knowledge, though far from a finished scholar in any. Where he possessed technical knowledge, he was fond of displaying it, however imperfect and faulty. He noted most birds he saw by what he believed their English names to be but recorded only a few native bird names. The inference is that he had no ornithological knowledge and asked for the native names of birds the like of which he had never heard of or seen at home. He saw a bird native to Powhatan lands notable for its "carnation-coloured wings," and preserved its Algonkian name as Ahshowcutters (also spelt Awshocutteis). There is no doubt that both he and Topsell tried with slightly different results to record in the phonetics of the English alphabet the same word.

The identify of this bird would seem to be most accurately arrived at by inquiring what bird common to Powhatan lands to a lay mind most nearly meets these specifications: (1) Not native in any form in England; (2) thrasherlike in over-all appearance; and (3) readily identified by carnation-colored wings.

Scientifically speaking *Setophaga ruticilla* and *Toxostoma rufum* are both native to America, but popularly speaking redstarts and so-called "thrashers" are both common in Europe. Topsell's drawing proves that the Aushouetta was not a redstart; Strachey's descriptive phrase, that it was not a thrasher. The layman would hardly

[1] Received June 14, 1946.

confuse *Setophaga ruticilla* with *Toxostoma rufum*. Nor would the layman be likely to say that either had red wings. The brown thrasher has no really red coloring in its feathers; it is brown. The redstart is mostly black with a few red feathers in wing and tail.

There is, however, a bird native to Powhatan lands and unknown as well by scientists as by laymen in any form in Europe. In sweep of tail, wings, size, and over-all appearance, a layman might well consider it thrasherlike. This is more true of the female than of the male. Almost any ornithologist would glance once at its beak, note the difference from the characteristic thrasher beak, and conclude it is not thrasherlike at all. But laymen are prone to overlook such scientifically conclusive identifying details.

This bird is migratory through and a year-round sojourner in Powhatan lands. It was first classified by English ornithologists as *Cardinalis virginiensis;* by modern American birdmen as *Richmondena cardinalis*. In winter it often flocks in groups of eight or more pairs. It is the carnation-colored winged bird of Powhatan countries. Accepting the Penobscot analogy as valid without the diminutive, it is the veritabie flame of Virginia tidewater woodlands and lawns.

We are aware that our methods are based on practical rather than scientific and technical considerations. But the methods used are the same as those by which Topsell's drawing and Strachey's description most likely were arrived at in the first place. Although we acknowledge that we may not have established the identity beyond all possibility of rational dispute, we feel that properly construed, the available evidence justifies the assertion that the *Aushouetta* and the *Ahshowcutters* are one and the same bird, and that bird is the cardinal.

ENTOMOLOGY.—*Notes on Oecophoridae, with descriptions of new species.*[1] J. F. Gates Clarke, U. S. Bureau of Entomology and Plant Quarantine.

Since the publication of my revision of the North American Oecophoridae[2] much additional material and information have come to hand. The purpose of this paper is to bring this information together and publish it as a supplement to my former work. In December 1945 I was able to study certain types of Walker, Zeller, and Meyrick, in the British Museum. With information obtained from this study it is now possible for me to correct some erroneous conceptions and to place properly species formerly known only from descriptions. In this paper eight species are described as new, and notes on distribution, food plants, and synonymy are given on thirty others. I take this opportunity also to correct some errors that occurred in my revision.

The accompanying drawings were made and the plates composed by Arthur D. Cushman, chief scientific illustrator, Bureau of Entomology and Plant Quarantine.

Unless otherwise indicated specimens were collected and reared by the author.

For purposes of brevity references to my revision in the text are given by page or plate numbers only.

Agonopterix fulva (Walsingham)

Depressaria fulva Walsingham, Trans. Amer. Ent. Soc. 10: 175. 1882.

Depressaria endryopa Meyrick, *Exotic Microlepidoptera* 2: 223. 1918. (New synonymy.)

I have studied the unique type in the British Museum. The strikingly distinct genitalia of this species are unmistakable, and I do not hesitate to reduce Meyrick's name to synonymy.

Agonopterix oregonensis Clarke

Since describing this species in my revision I have reared a series of over a hundred specimens, from several hosts listed below, from various localities in California and Washington.

[1] Received December 2, 1946.

[2] Clarke, J. F. Gates, *Revision of the North American moths of the family Oecophoridae, with descriptions of new genera and species*. Proc. U. S. Nat. Mus. 90: 33–286, pls. 1–48. 1941.

The species will be found through most of western North America because of its rather general feeding habits.

The California localities are as follows: Cottonwood, Tehama County; Pacheco Pass; Presidio of Monterey and Marina, Monterey County; Hunter Liggett Military Reservation, San Luis Obispo County. Washington: Gilmer and Husum, Klickitat County. In addition I have received 11 specimens from Dr. W. Harry Lange, from San Juan Bautista, Calif., reared from a species of *Sanicula*.

The larvae from the California localities were collected in February, March, and April, and those from Washington in May. The moths emerged through April and May to the 5th of June.

Larva: Length 12–14 mm. Head and thoracic shield black, the latter bisected by a fine brown line. First thoracic segment light brown, the legs and spiracles black. Second and third thoracic and abdominal segments dull yellowish infused with grayish dorsally. Setae brown. Spiracles narrowly edged with black. The prepupal larva has three well-defined grayish dorsal lines and the three terminal segments edged with grayish. Larvae of this species collected at Hunter Liggett Military Reservation differ from the above in having the second and third pairs of thoracic legs with tibia and tarsi brownish to black exteriorly.

Food plants.—Eryngium vaseyi Coult. & Rose, *Lomatium caruifolium* (H. & A.) Coult. & Rose, *L. marginatum* (Benth.) Coult. & Rose, *L. nudicaule* (Pursh) Coult. & Rose, *L. utriculatum* (Nutt.) Coult. & Rose, *Sanicula bipinnata* H. & A., *S. bipinnatifida* Dougl., *S. laciniata* H. & A., *S. nevadensis* S. Wats., and *S. tuberosa* Torr.

Agonopterix nebulosa (Zeller)

The food plant of this species, not previously recorded, is a species of *Antennaria*. I now have a series of one ♂ and four ♀♀, the larvae of which I collected at Lakeview, Chesterfield County, Va. The moths emerged from May 26 to 30, 1942.

The larva of this species ties the leaves of the host, as does its near relative *antennariella*.

Agonopterix fusciterminella Clarke

The range of this species is apparently wide. Originally it was described from material from British Columbia and California. I now have it from New Mexico (♂, 2♀♀, July 24–31; no collector) and Manitoba (♀, Winnipeg; no date or collector).

Agonopterix rosaciliella (Busck)

The first specimens of this species from California were submitted by Edward C. Johnston, of Seattle, Wash. They are from the following localities: Inverness, Marin County, three ♂♂ (28-I-40); Spring Mountain, Sonoma County, ♂, ♀ (16-III-39, 26-I-40).

Agonopterix pallidella (Busck)

Depressaria pallidella Busck, Proc. U. S. Nat. Mus. **27**: 765. 1904.

Depressaria sciadopa Meyrick, *Exotic Microlepidoptera* **2**: 315. 1920. (New synonymy.)

There are two males of *sciadopa* Meyrick in the British Museum, both in poor condition. Of these I have selected the smaller one as the lectotype. This specimen is labeled "Field, British Columbia (4000 ft., A.J.T., 28-8-18)."

A study of the male genitalia of the lectotype shows them to be identical to those of *pallidella*, and Meyrick's name falls as a synonym.

My concept of *sciadopa*, based solely on Meyrick's description, led me to place the species in the *ciniflonella* group of *Martyrhilda*. Meyrick's species is not referable to *Martyrhilda*, but the species described and figured by me is referable to *Martyrhilda* and requires a name. In the following pages the proper correction is made and a new name supplied.

Agonopterix sabulella (Walsingham)

In addition to the specimens discussed in my revision I now have before me a series of nine specimens from King Mountain, San Mateo County, Calif. (May and July dates, W. Harry Lange), reared from *Eriophyllum confertiflorum* Gray, and a male and female from Chuckanut Bay, Bellingham, Whatcom County, Wash. (13-14-VI-46, J. F. G. Clarke), reared from *Eriophyllum lanatum* (Pursh) Forbes.

The Washington specimens are considerably darker than the California examples, but there is no doubt as to their identity.

Larva: Length 13–16 mm, subcylindrical. Head luteous with irregular light brown markings, darker around margins; ocellar area dark brown to black. Cervical shield and anal plate yellowish, the former with a few dark brown

markings on lateral and posterior margins. Thoracic and abdominal segments yellowish green with three gray-green dorsal longitudinal stripes. Thoracic legs yellowish. Spiracles small, black.

The larvae are abundant and together with *Nephopteryx olivalis* Packard, nearly strip the host of its leaves. Young larvae of *sabulella* are found in the terminal leaves and buds of the host, the older ones in the lateral leaves which they tie to the stalk of the plant.

The food plant grows on the rocky slopes and beside the railroad tracks around the seashore of Chuckanut Bay, south of Bellingham.

Agonopterix dammersi, n. sp.
Figs. 1–1a, 8

Similar to *sabulella* but grayer in appearance.

Labial palpus with second segment cream color interiorly, more ocherous exteriorly; brush trumpet-shaped, developed only in terminal half, irrorate with black and suffused with fuscous; third segment more ocherous with subbasal, supramedial, and terminal bands black. Antenna fuscous. Face ocherous-white. Head, thorax, tegula, and forewing light grayish ocherous; thorax sparsely irrorate with black scales; forewing irrorate with black and with irregular patches of underlying gray suffusion, especially toward termen; at basal third and at end of cell two usually ill-defined, small, black discal spots; between these, costad, a moderately large dark shade; along costa and around termen a series of small black spots; cilia mottled; on the underside of forewing, along costa, and around termen, black irrorations. Hind wing fuscous; cilia light grayish fuscous with darker subbasal and subterminal bands; on the underside of hind wing, on costa and around termen, black irrorations. Legs cream color; first and second pairs strongly overlaid with blackish fuscous; third pair suffused and irrorate with fuscous. Abdomen light grayish ocherous above, cream color, with four rows of black spots, beneath.

Male genitalia.—Harpe moderately broad, sacculus rather narrow; cucullus rounded; clasper nearly straight, digitate. Anellus longer than broad, expanded laterally posterior to middle, sharply convex on anterior edge, with small lateral lobes. Aedeagus slightly bent; vesica with a small, finely spinulate, elongate patch. Vinculum rounded, with large dorsoanterior process. Transtilla a narrow sclerotized band with large lateral lobes. Socii very large, compressed.

Female genitalia.—Genital plate rather lightly sclerotized, broad, strongly convex on anterior edge at middle. Ostium large, at center of genital plate. Ductus bursae entirely membranous gradually tapering into the small bursa copulatrix; inception of ductus seminalis just before ostium. Signum a small, toothed plate at extreme anterior end of bursa copulatrix.

Alar expanse, 20–23 mm.

Type.—U.S.N.M. no. 58012.

Type locality.—Forest Home, San Bernardino County, Calif.

Food plant.—*Senecio douglasii* D. C.

Remarks.—Described from the ♂ type, two ♂ and four ♀ paratypes, collected and reared by Commander C. M. Dammers. One ♀ paratype is from Riverside, Calif. (April 24, 1938), the remainder are from the type locality and bear dates from June 13 to 16, 1940.

Paratypes in U. S. National Museum and Commander Dammers' collection.

This species can be distinguished from *sabulella* by its grayer color and by the slender terminal segment of the palpus with its three black bands; the terminal segment of the palpus of *sabulella* never has more than two ill-defined bands.

The clasper of the harpe of *sabulella* has a distinct terminal knob, while that of *dammersi* is straight, digitate, and lacks the knob. The lobes of the ovipositor of *dammersi* have more setae than those of *sabulella*, and the ostium is at the center of the genital plate in *dammersi* but at the posterior edge in *sabulella*.

In the color key of my revision *dammersi* runs to *fusciterminella*, but can be distinguished from that species by the complete absence of any reddish coloring.

Named in honor of Commander Dammers who has been a friendly contributor to the National Collection for many years.

Agonopterix latipalpella Barnes and Busck

In addition to the type series I now have a series of one ♂ and three ♀ ♀ from San Benito and Brownsville, Tex. These bear April dates.

Agonopterix murmurans (Meyrick)

Depressaria murmurans Meyrick, *Exotic Microlepidoptera* **3**: 382. 1927.—Clarke, Proc. U. S. Nat. Mus. **90**: 39. 1941.

This species has genitalia similar to *psoraliella* but is of quite different appearance. Until the species is reared or intergrades between this and *psoraliella* are found I am retaining *murmurans* as a distinct species.

In the U. S. National Collection there are three specimens as follows: Utah: Eureka, ♂ (VII-1-11, Tom Spalding); Stockton, ♀ (no date, Tom Spalding). Washington: Pullman, ♀ (1-X-32, J. F. G. Clarke).

Agonopterix robiniella (Packard)

To the localities previously recorded for this species a single record for New Mexico (♂, Jemez Springs, July) may now be added.

Agonopterix posticella (Walsingham)

This species has not been recorded before north of Oregon. We now have a series of two ♂♂ and three ♀♀ from Chimacum, Kitsap County, Wash. (August 2, 1944), reared from *Psoralea physodes* Dougl.

The Washington specimens are considerably darker than the California and Oregon examples, but there is no doubt about their identity.

Martyrhilda canella (Busck)

In Fig. 44, I figured the wing venation of this species incorrectly. The figure of the hind wing shows only seven veins and should show eight. In the generic diagnosis eight veins are correctly indicated.

Martyrhilda thoracenigraeella (Chambers)

An additional four specimens (three ♂♂, ♀) of this species have come to hand. These were collected by E. C. Johnston at Petaluma, Calif. (2-20-X-1936).

Martyrhilda thoracefasciella (Chambers)

A large series of this species, which has accumulated, indicates it is widespread through California and Arizona. In addition we have one specimen from Pyramid Lake, Nev. (♀, no date or collector).

Martyrhilda isa, n. sp.

Martyrhilda sciadopa Clarke (*not* Meyrick), Proc. U. S. Nat. Mus. **90**: 144, pl. 24, fig. 149, 149a; pl. 41, fig. 236. 1941.

Type.—U.S.N.M. No. 58014.

Type locality.—Aweme, Manitoba.

Food plant.—Unknown.

Remarks.—Under the name *sciadopa* I discussed and figured this species. In the foregoing pages Meyrick's name is discussed under *Agonopterix pallidella* (Busck).

The paratypes consist of the specimens listed in my revision plus the following: Alberta: Edmonton, four ♂♂, six ♀♀ (March, April, and May, Owen Bryant); Manitoba: Aweme, ♀ (21-III-05, Criddle); Cartwright, ♂ (1-IV-05, E. F. Heath); Ontario: Hymers, six ♂♂, two ♀♀ (August and September). Paratypes in the U. S. National and British Museums.

Depressaria artemisiella McDunnough

Heretofore recorded only from the type locality in British Columbia. There is one specimen in the U. S. National Museum from Deer Creek, Provo Canyon, Utah (♂, 8-IX-18, Tom Spalding).

Depressaria artemisiae dracunculi Clarke

The range of this subspecies is now extended to Manitoba. Specimens submitted are from Aweme (♂, 9-IX-28; ♀, 2-VIII-20. N. Criddle).

Depressaria alienella Busck

Depressaria alienella Busck, Proc. U. S. Nat. Mus. **27**: 765. 1904.

Depressaria nymphidia Meyrick, *Exotic Microlepidoptera* **2**: 223. 1918. (New synonymy.)

Depressaria corystopa Meyrick, *Exotic Microlepidoptera* **3**: 382. 1927. (New synonymy.)

The types of both of Meyrick's species are in the British Museum.

I have seen the types and have examined the genitalia of both. The moths agree with specimens in the U. S. National Museum from widespread localities in North America and the genitalia match perfectly. Meyrick's names therefore fall as synonyms of *alienella*.

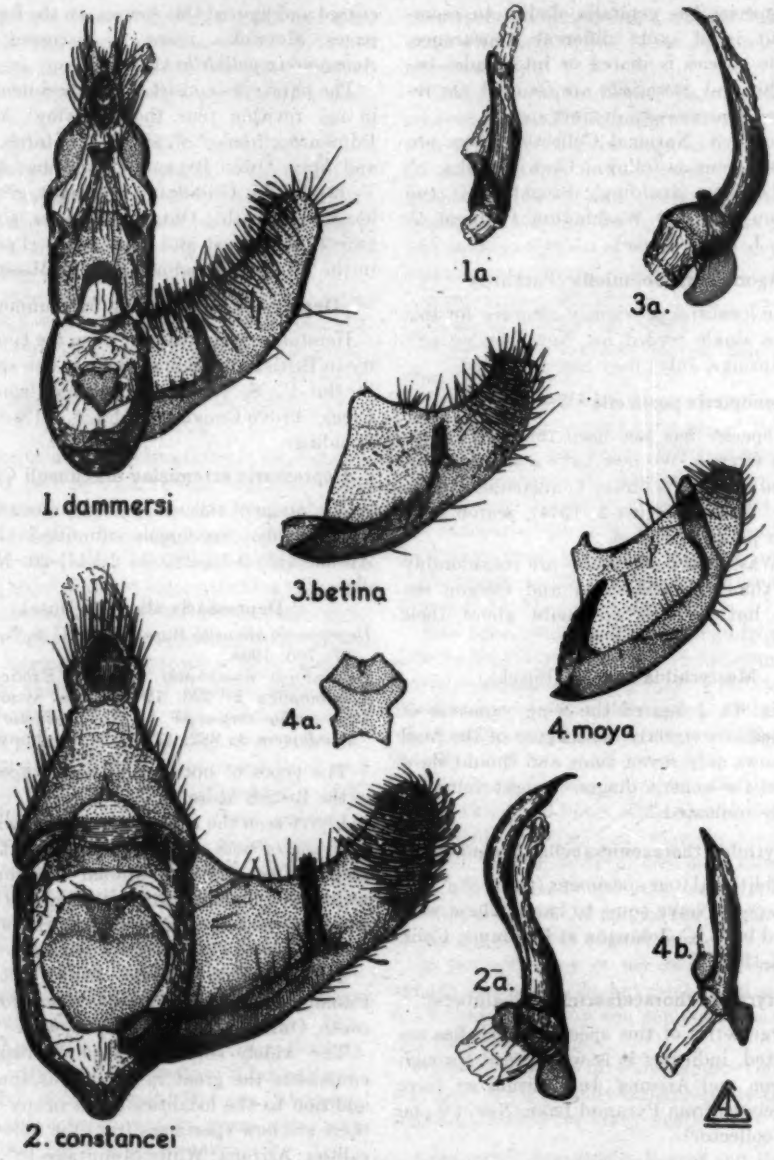
Type localities.—Kaslo, British Columbia, Canada (*alienella*); Colorado (*nymphidia*); Toronto, Ontario, Canada (*corystopa*).

The widely separated type localities only emphasize the great range of this species. In addition to the localities given in my revision there are now specimens from the following localities: Arizona: White Mountains (♂, August 1925, O. C. Poling); Connecticut: East River (♀, July, Charles R. Ely).

Depressaria constancei, n. sp.

Figs. 2–2a, 9–9a

This is the largest species of *Depressaria* I have seen from North America and resembles only the following newly described species.



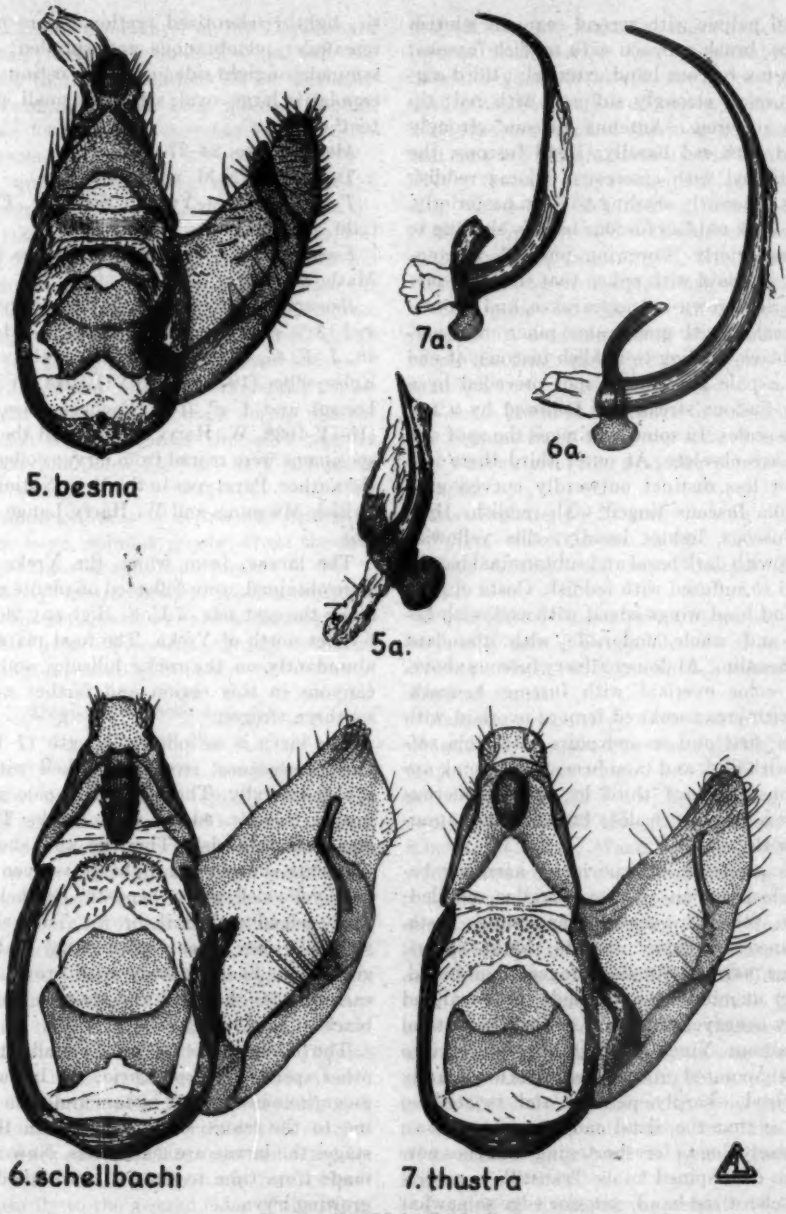
FIGS. 1–4.—Male Genitalia

1–1a. *Agonopterix dammersi*, new species: 1, Ventral aspect of male genitalia with left harpe and aedeagus removed; 1a, aedeagus, lateral view.

2–2a. *Depressaria constancei*, new species: 2, Ventral aspect of male genitalia with left harpe and aedeagus removed; 2a, aedeagus, ventrolateral view to show twist.

3–3a. *Depressaria betina*, new species: 3, Ventral aspect of right harpe; 3a, aedeagus, lateral view.

4–4b. *Depressaria moya*, new species: 4, Ventral view of right harpe; 4a, ventral aspect of anellus: 4b, aedeagus, lateral view.



FIGS. 5–7.—Male Genitalia

5–5a. *Depressaria besma*, new species: 5, Ventral aspect with left harpe and aedeagus removed; 5a, aedeagus, lateral view.

6–6a. *Depressaria schellbachi*, new species: 6, Ventral aspect with left harpe and aedeagus removed; 6a, aedeagus, lateral view.

7–7a. *Depressaria thustra*, new species: 7, Ventral aspect with left harpe and aedeagus removed; 7a, aedeagus, lateral view.

Labial palpus with second segment whitish ocherous, brush suffused with reddish fuscous; near base a fuscous band exteriorly; third segment fuscous strongly suffused with red; tip reddish ocherous. Antenna fuscous strongly suffused with red basally. Head fuscous, the scales tipped with cinereous. Thorax reddish fuscous anteriorly shading to gray posteriorly. Tegula dark reddish fuscous basally shading to gray posteriorly. Forewing purplish fuscous, heavily overlaid with red so that the wing presents a rich brown-red appearance, and irrorate and streaked with gray scales; inner angle narrowly black shading to reddish fuscous; at end of cell a pale gray discal spot preceded by a narrow fuscous streak and followed by a few fuscous scales. In some specimens the spot and streak are obsolete. At outer third there is a more or less distinct outwardly curved gray line; cilia fuscous tinged with reddish. Hind wing fuscous, lighter basally; cilia yellowish fuscous with dark basal and subterminal bands; beyond *1b* suffused with reddish. Costa of both fore- and hind wings edged with yellowish beneath and whole underside with abundant fuscous scaling. Abdomen silvery fuscous above, cream color overlaid with fuscous beneath. Legs with cream-colored femora overlaid with fuscous; first and second pairs with tibia suffused with pink and tarsi fuscous with pink annulations; tibia of third leg with numerous yellowish hairlike scales; tarsi fuscous annulated with yellowish.

Male genitalia.—Harpe much narrower beyond clasper than at base; cucullus rounded; clasper straight, slightly exceeding costa, roughened by many minute, blunt spines; sacculus narrow. Anellus longer than broad, broader at middle than at ends; proximal end slightly concave, distal end strongly so; lateral lobes absent. Vinculum slightly produced into a bluntly pointed process. Aedeagus moderately sclerotized, sharply pointed and twisted so much so that the distal end cannot be shown adequately due to foreshortening. Gnathos normal, an oval spined knob. Transtilla a moderately sclerotized band, anterior edge somewhat produced at middle and shallowly excavate on each side; transtillar lobes well developed. Uncus and socii forming a small hood.

Female genitalia.—Genital plate narrowed and strongly sclerotized at ostium; ostium triangular. Ductus bursae with a broad crescentic, lightly sclerotized section before ostium, remainder membranous and spiraled; ductus seminalis on right side just before ostium. Bursa copulatrix large, oval; signum a small, narrow, toothed plate.

Alar expanse, 24–27 mm.

Type.—U.S.N.M. no. 58007.

Type locality.—Yreka, Siskiyou County, Calif.

Food plant.—*Lomatium californicum* (Nutt.) Math. & Const.

Remarks.—Described from the ♂ type, 12 ♂ and 13 ♀ paratypes from Yreka (21-V to 2-VI-46, J. F. G. Clarke), four ♀ paratypes from Kelseyville, (19-IV to 25-VII-1944, W. Harry Lange) and 1 ♂ from Pacheco Pass, Calif. (16-IV-1939, W. Harry Lange). All the Yreka specimens were reared from larvae collected by the author. Paratypes in the U. S. National and British Museums and W. Harry Lange Collection.

The larvae, from which the Yreka moths were obtained, were collected on plants growing along the east side of U. S. Highway 99, about 6 miles north of Yreka. The food plant grows abundantly on the rocky hillsides and in the canyons in this region and farther north in southern Oregon.

The larva is as follows: Length 17–18 mm. Head testaceous, strongly marked with dark brown laterally. Thoracic shield pale greenish brown broadly edged with black. Thoracic legs pale yellowish. Thoracic and abdominal segments concolorous, light gray-green above, pale yellowish green beneath. Spiracles narrowly edged with dark brown. Tubercles pale whitish green; setae brown. Anal plate light gray green finely irrorate with brown. In the early instars the head and thoracic shield are black.

The habits of this species are similar to many other species of *Depressaria*, the larvae being gregarious in the first instars and then spreading to the leaves of the plants. In the later stages the larvae are leaf rollers. New rolls are made from time to time to accommodate the growing larva.

Larvae and pupae are preserved in the U. S. National Museum.

This species keys to *juliella*, but is at once distinguished from it by the deep brown-red color.

This species is named in honor of my good

friend Lincoln Constance, of the Department of Botany, University of California, who has made all the determinations of the Umbelliferae for me and whose keen interest and enthusiasm have been a constant source of encouragement.

This and the following species, although *Lomatium* feeders, present a departure from the usual species (*angustati-multifidae* complex) feeding on these plants, both in coloration and male genitalia. The female genitalia retain the features of the other species and the larvae, like those of *angustati*, etc., have setal group VII on the first abdominal segment *tri*setose.

Both *betina* and *constancei* are reddish brown in general appearance, though amply distinct from each other, whereas the other species (*angustati, multifidae*, etc.) are dark fuscous in general coloration.

The male genitalia of *betina* and *constancei* lack the large, spinous process from the sacculus and the aedeagus is atypical.

The above characteristics seem to indicate that *betina* and *constancei* are transitional between the *juliella-heracliana* group and that containing *angustati-multifidae*.

Depressaria betina, n. sp.
Figs. 3–3a, 10

Strikingly similar to the foregoing species but smaller and more contrastingly marked.

Labial palpus with second segment creamy white with reddish-brown and fuscous scales mixed in the brush; exteriorly basal third broadly banded with blackish to reddish fuscous; at apical third an indication of a narrower similarly colored band; third segment blackish fuscous, with tip reddish ocherous. Antenna dark reddish fuscous narrowly annulated with reddish ocherous. Head and thorax cinereous, the former mixed with some fuscous scaling, the latter reddish fuscous anteriorly; tegula concolorous with thorax. Forewing dull grayish fuscous strongly overlaid with reddish fuscous scales and with the veins indicated by black streaks; anal angle narrowly black, shading outwardly to the ground color of the wing; discal spot at end of cell usually well defined, preceded by a streak of mixed gray and black scales and followed by a black streak; on costa, about middle, a small fuscous spot; at outer third an outwardly curved gray line; cilia fuscous with reddish suffusion. Hind wing grayish fuscous, darker at margins; cilia light fuscous with darker basal and subterminal bands; beyond *1b* the cilia are narrowly tipped with pink. Undersides of fore- and hind wings dark fuscous; costa of forewing pale yellowish and that of hind wing creamy white. Abdomen silvery fuscous above, cream-colored, irrorate and suffused with fuscous, beneath. Legs creamy white overlaid with fuscous. Fore- and mid-tibiae and tarsi tinged with pink; hind tarsi annulated with pale reddish ocherous.

Male genitalia.—Similar to *constancei* but clasper not reaching costa, anellus nearly as broad as long and vinculum more broadly rounded.

Female genitalia.—Similar to *constancei* but the signum three times the size of *constancei* and with anterior and posterior points well developed.

Alar expanse, 19–23 mm.

Type.—U.S.N.M. no. 58008.

Type locality.—Gilmer, Klickitat County, Wash.

Food plants.—*Lomatium triternatum macrocarpum* (Coult. & Rose) Mathias, *L. dissectum* (Nutt.) Math. & Const., *L. columbianum* Math. & Const.

Remarks.—Described from the ♂ type, 18 ♂ and 11 ♀ paratypes as follows: Gilmer (type, 13 ♂♂ and eight ♀♀, 30-V to 10-VI-46); Husum (♀, 30-V-46); Lyle (five ♂♂ and two ♀♀, 5-10-VI-46). All localities are in Klickitat County, Wash., and all specimens were reared from larvae collected by the author.

L. triternatum macrocarpum was found on a steep open hillside growing in a *Rhus toxicodendron-Balsamorhiza sagittata* association and below this area, a mile east of Gilmer, on open, rocky rolling ground in which *Quercus* and *Salix* were the dominant plants. *L. dissectum* may be found growing among the brush on the roadside at Husum. *L. columbianum* grows above the Columbia River on the steep, rocky slopes. The collections from this plant were made 1 mile west of Lyle between the highway and the river.

Feeding of the larvae appears to be limited to the umbels and leaves, depending on the host. *L. dissectum* and *L. triternatum* usually have the umbels attacked but, since *L. columbianum* is in fruit at the time the larva of this species appears, the feeding takes place in the webbed leaves.

The larvae of this species and *D. constancei* are, like the adults, strikingly similar. The dark markings of the head and thoracic shield are more intense in *betina* than in *constancei*. The larvae of *constancei* average larger, and three, rather indistinct, dorsal longitudinal lines of *betina* are lacking in this species.

Larvae and pupae are preserved in the U. S. National Museum.

With *constancei* this species keys to *juliella* in the color key but like *constancei* is distinguished from that species by the much darker color. The grayish fuscous ground color of *betina* will separate it from *constancei*.

Depressaria schellbachi, n. sp.
Figs. 6–6a, 13

Labial palpus ocherous white with a pink tinge; second segment irrorate with pink-tipped fuscous scales in the brush and with an indistinct fuscous spot subbasally and apically on the outside; third segment blackish fuscous, tip reddish ocherous. Antenna blackish fuscous with ill-defined narrow lighter annulations. Head reddish ocherous to reddish fuscous. Thorax and ground color of forewing reddish ocherous; anterior part of thorax and base of tegula blackish fuscous gradually shading to the lighter ground color. Forewing overlaid with fuscous; inner angle black shading to fuscous outwardly; in cell two, sometimes confluent, black longitudinal dashes; in fold, at basal third, a short black dash; veins 9, 10, and 11 sometimes marked by fine, black, longitudinal dashes; in center of wing at end of cell, a small reddish ocherous spot; cilia pale fuscous with a roseate tinge; underside of costa narrowly, but clearly, reddish ocherous. Hind wing whitish basally shading to dark fuscous at margins; cilia pale fuscous with a broad fuscous subbasal band and with a roseate tinge, especially apically. Legs ocherous-white overlaid and irrorate with fuscous; tarsi with reddish-ocherous annuli. Abdomen light fuscous; underside with considerable median ocherous-white scaling.

Male genitalia.—Harpe broad basally, abruptly narrowed to the bluntly pointed cucullus; costa almost straight, clasper narrow, transverse to middle, then sharply and outwardly angulate; basal process from sacculus narrow and almost of equal width throughout, slightly longer than anellus, gently excurved and finely spinulate. Anellus as broad as long; anterior edge deeply excavate; lateral edges convex. Aedeagus two and a half times as long as costa of harpe, slender, evenly curved, sharply pointed; ventrobasal process large, shovel-shaped, outer edge emarginate; dorsobasal process small, winglike. Transtilla very lightly sclerotized, lobes mainly indicated by small setae. Gnathos elongate oval. Uncus and socii greatly reduced.

Female genitalia.—Genital plate narrow, posterior edge emarginate; ostium slitlike; anterior sclerotized pockets of genital plate small, shallow. Ductus bursae with more than half its length strongly sclerotized, this portion crescentic; inception of ductus seminalis well before ostium. Signum a large oval toothed plate.

Alar expanse, 21–24 mm.

Type.—U.S.N.M. No. 58013.

Type locality.—Shoshone Point, Grand Canyon, Ariz., elevation 7,050 feet.

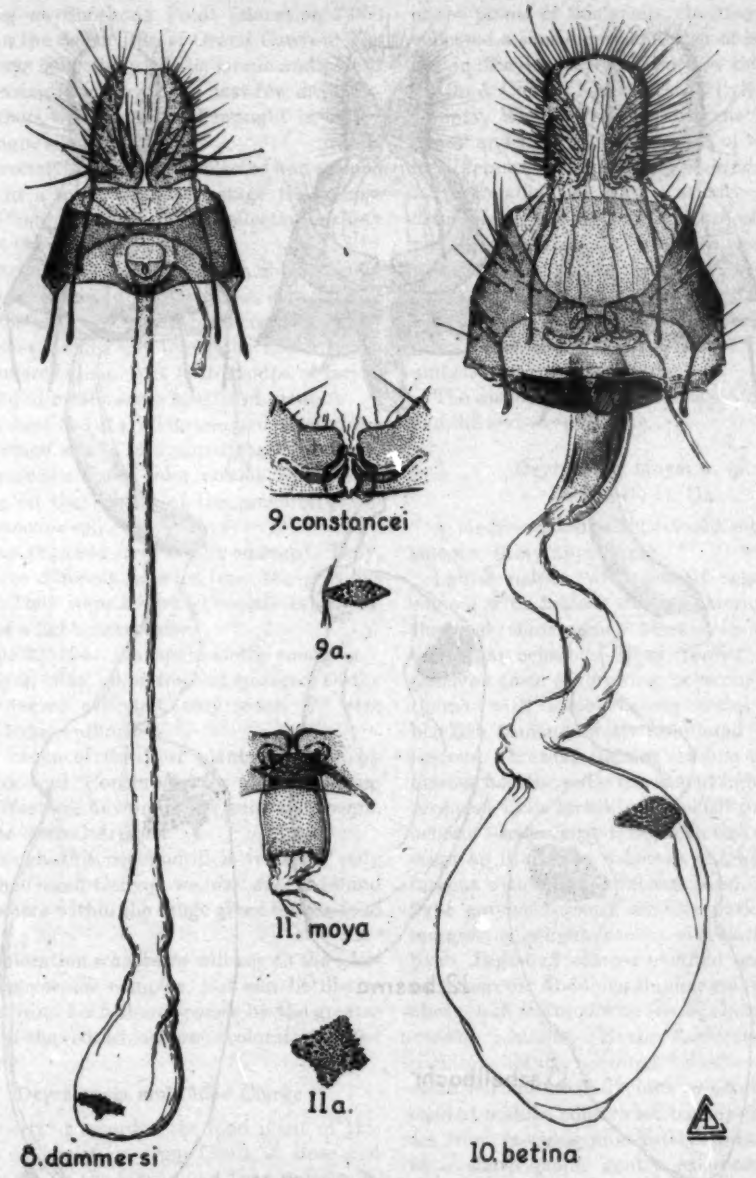
Food plant.—Lomatium macdougali Coult. and Rose.

Remarks.—Described from the ♂ type, five ♂ and three ♀ paratypes from the Grand Canyon (June dates, 1944 and 1946, Louis Schellbach, 3d). Paratypes in the U. S. National and British Museums and in the Grand Canyon National Park Collection.

In genitalia *schellbachi* is nearest to *whitmani*. It differs from the latter species in having a longer basal process from the sacculus and a longer anellus. In the female, *schellbachi* lacks the pronounced anterior and posterior median points of the signum and the posterior edge of the genital plate is emarginate. From other species of *Depressaria* in this complex *schellbachi* differs by its pronounced reddish coloration.

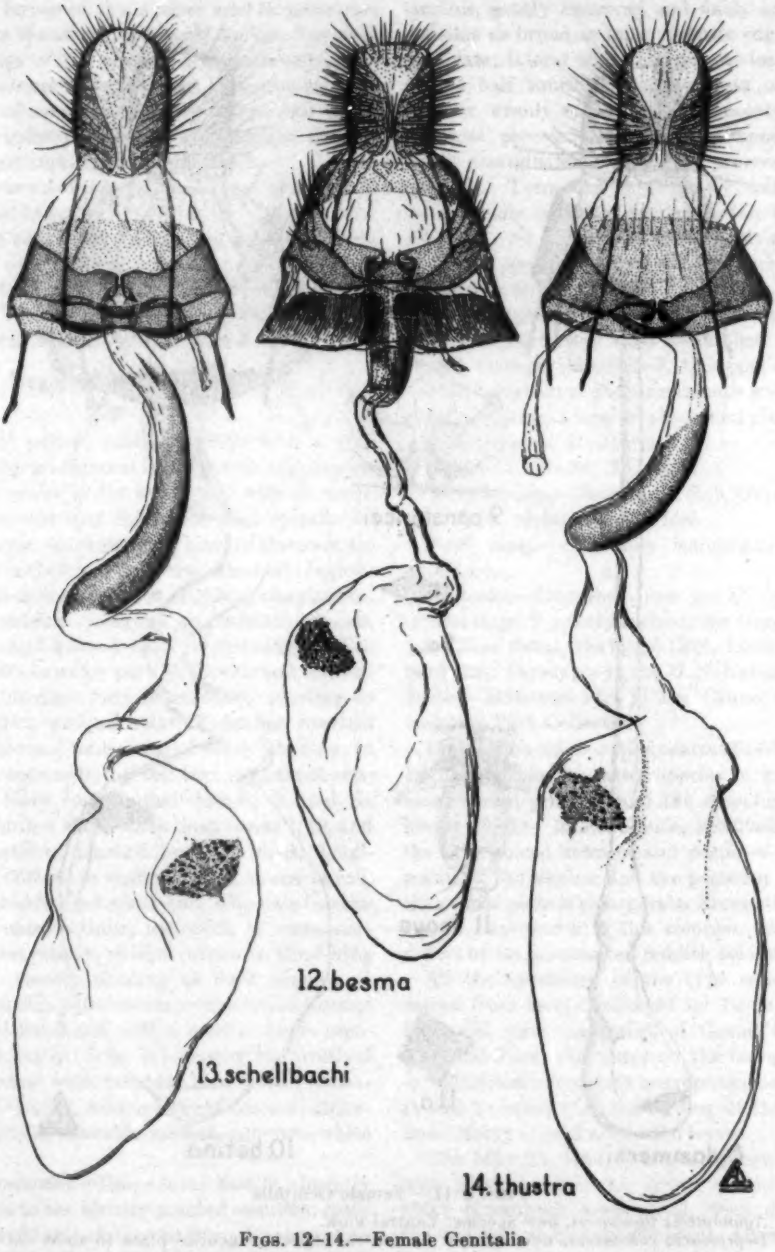
All the specimens of the type series were reared from larvae collected by Louis Schellbach, 3d, park naturalist of Grand Canyon National Park. His notes on the larvae, with my additions in brackets are reproduced below. It will be noted that the feeding of the *schellbachi* larvae is confined to the leaves.

"On May 28, 1944, two small green larvae, with black heads, were found on the above plant [*Lomatium macdougali*], deep down in the leaf stem sheaths of the plant. Attention to the plant was due to a cobwebby appearance about the base of the leaves where they leave the main stem or root. The plant was found



FIGS. 8–11.—Female Genitalia

8. *Agonopterix dammersi*, new species: Ventral view.
9–9a. *Depressaria constancei*, new species: 9, Ventral aspect of genital plate to show ostium; 9a, signum.
10. *Depressaria betina*, new species: Ventral view.
11–11a. *Depressaria moya*, new species: 11, Ventral view of ostium and sclerotized portion of ductus bursae; 11a, signum.



FIGS. 12–14.—Female Genitalia

12. *Depressaria besma*, new species: Ventral aspect.
13. *Depressaria schellbachi*, new species: Ventral aspect.
14. *Depressaria thustra*, new species: Ventral aspect.

growing at Shoshone Point (elevation 7,050 feet) on the South Rim of Grand Canyon. The plant was collected with the larvae and placed in a rearing jar. During the next few days several others were found and brought in to the workshop.

"Eleven (11) in all were collected and seemed to be in a more advanced stage than those reared from the flower head collected on May 9, 1944 [*Sparganothis* sp.]

"With the knowledge gained in observing the specimens from the May 9 larvae, it was found that this group of larvae, collected feeding on the leaves, would not touch the flower heads when offered them. Yet both groups of larvae were found on the same species of plants.

"On June 3, 1944, all larvae had entered the pupal stage and it was noted that the pupae cases were of a brown color, not black like those feeding on the flowers of the previous group [*Sparganothis* sp.].

"June 18, 1944, two moths emerged. They, too, were different in color from the previous group. They were a dark chocolate brown instead of a light straw color.

"June 22, 1944, four more moths emerged.

"July 2, 1944, all moths had emerged. Of the eleven larvae collected, only seven (7) were reared to parenthood."

The range of the host plant, as given by Mathias and Constance,[3] is "Great Basin, from Western Wyoming to central Oregon, south to central Arizona."

Although this oecophorid is recorded only from the Grand Canyon we may expect to find it anywhere within the range given for the food plant.

On coloration *schellbachi* will key to the *whitmani-leptotaeniae* complex, but can be distinguished from both those species by the greater extent of the reddish ocherous coloration of the forewing.

Depressaria multifidae Clarke

Formerly[4] I recorded the food plant of this species as *Lomatium grayi* Coult. & Rose and discussed how the larvae had been given substitute food and had refused it. The larvae of this species do feed on at least one other species of the plants of this genus. On May 9, 1946, I collected a considerable number of larvae feeding in the leaves of *Lomatium columbianum* Math. & Const., 1 mile west of Lyle, Klickitat County, Wash. From these larvae I obtained one ♂ and 12 ♀ ♀, the genitalia of which show no differences from those of *multifidae*.

Presumably the larvae usually pupate in debris or in the soil at the base of the host, but one pupa, from which a moth was obtained, was found in a hollow peduncle. There was evidence in this and other stalks of extensive feeding within, and several were found with exit holes cut in the apex between the rays of the umbels.

The moths emerged in the last week of May and the first week in June.

Depressaria moya, n. sp.
Figs. 4–4b, 11–11a

A medium-sized, dark-colored moth with a smooth, shiny appearance.

Labial palpus with second segment buff colored with fuscous shading exteriorly and in the brush; third segment blackish fuscous tipped with light ocherous. Head, thorax, and basal patch on costa of forewing, ocherous; head and thorax with some fuscous scales. Antenna blackish fuscous faintly annulated with paler fuscous. Forewing fuscous shading to blackish fuscous basally; outer discal spot light ocherous preceded by a streak of blackish fuscous and ocherous scales mixed; between this streak and costa an ill-defined ocherous patch; cilia pale fuscous with darker subbasal band. Hind wing light grayish fuscous, slightly darker toward margins; cilia light fuscous with dark subbasal band. Legs buff colored overlaid and suffused with fuscous. Abdomen shining grayish fuscous above, buff suffused with fuscous beneath.

Male genitalia.—Harpe moderately broad, cucullus bluntly pointed; clasper exceeding costa, flattened distally, bluntly pointed, broadened at middle, constricted basally; basal process from sacculus moderately stout, tapering to a sharp point, gently excurved. Anellus longer than broad, the broadest part being posterior of the middle, on each side there is a small excavation and the anterior and posterior edges are concave, the former more so than the latter. Aedeagus short, curved, pointed with a roughly rectangular dorsal process and a

[3] MATHIAS, MILDRED E., and CONSTANCE, LINCOLN. North Amer. Flora **28B**, pt. 2: 240. 1940.

[4] Proc. U. S. Nat. Mus. **90**: 187. 1941.

shovel-shaped ventral process at base. Vinculum narrow, slightly evaginate anteriorly. Transtilla a narrow, lightly sclerotized band with well-developed lobes. Socii small, mainly indicated by a few hairs.

Female genitalia. — Genital plate broad, strongly sclerotized, anterior edge shallowly concave. Ostium narrow with small raised portion of genital plate, on each side, fused with the ductus bursae. Posterior third of ductus bursae sclerotized, gently tapered to membranous anterior section; inception of ductus seminalis from well before ostium on right side. Signum a large square toothed plate.

Alar expanse, 18–19 mm.

Type.—U.S.N.M. no. 58011.

Type locality.—Hornbrook, Siskiyou County, Calif.

Food plant.—*Lomatium vaginatum* Coult. & Rose.

Remarks.—Described from the ♂ type and 2 ♀ paratypes all from the type locality.

The larvae of this species were collected April 7, 1944, by the author. The first larva entered the soil in the rearing tin on April 12, pupated on the 14th, and the moth emerged on May 5, 1944.

The host, on which these larvae were found, was growing abundantly on a grassy hillside along the east side of U. S. Highway 99 about 1 mile south of the Oregon-California line. The plant may be found commonly well into southern Oregon, and no doubt this *Depressaria* will be found there also.

The larva is as follows: Length 10–12 mm. Head and thoracic shield, pale whitish green suffused with pale yellowish brown and variously spotted with brown to black, especially laterally. Thoracic legs pale yellowish with a brown spot at the distal end of each segment exteriorly. Thoracic and abdominal segments concolorous light gray-green above and whitish green below; last segment entirely whitish green, this color extending forward onto the next segment forming a short subdorsal stripe on each side. Anal plate yellowish. Spiracles narrowly edged with dark brown. Tubercles, except center, pale whitish green; center and setae dark brown. Setal group VII of the first abdominal segment is *tri*setose.

Larvae and pupae preserved in the U. S. National Museum.

This species keys to *angustati-multifidae* from which there are no reliable color characters for separation. Locality and food plant will serve to separate *moya* from the above two or, if dissections can be made, the genitalia will establish the identity. In *moya* the clasper extends beyond the costa of harpe but in the other two the clasper is much shorter. In the females of *angustati* and *multifidae* the sclerotized part of the ductus bursae is separated from the ostium by a section of membrane, but in *moya* the ostium and sclerotized part are contiguous.

Depressaria besma, n. sp.
Figs. 5–5a, 12

Labial palpus, head, and thorax light buff; second segment of palpus with fuscous and brown scales mixed in the brush; third segment blackish fuscous except for tip which is buff; thorax with blackish fuscous and pale brown scales mixed anteriorly. Antenna blackish fuscous, with narrow, pale buff annulations. Forewing fuscous, almost black basally; at end of cell a well-defined pale buff spot followed by a few black scales and preceded by a more or less well-defined black line; veins 9, 10, and 11 indicated by black scaling; around apex and termen a series of black spots at the ends of the veins usually preceded by a few pale buff scales; costa pink tinged; cilia light fuscous with a dark subbasal band. Hind wing light grayish fuscous, darker outwardly; cilia sordid buff with a fuscous subbasal band. Legs, except second and third pairs of tarsi, pale buff suffused with fuscous; tarsi blackish fuscous, buff annulated. Abdomen shining grayish above, pale buff below, broadly shaded with grayish laterally.

Male genitalia.—Harpe broard and short; cucullus bluntly pointed; clasper exceeding costa, flattened, excurved, bluntly pointed; basal process from sacculus slender, pointed and sharply outwardly angulate from slightly beyond base. Anellus broader than long, roughly diamond-shaped; anterior and posterior edges with deep V-shaped excavations. Aedeagus short, stout, curved, gently tapered to a point; base with large winglike structure dorsally and broad shovel-shaped ventral process. Transtilla a narrow, lightly sclerotized band with moderately well-developed lobes. Vinculum narrow, broader at middle, rounded. Socii very small.

Female genitalia.—Genital plate strongly sclerotized; anterior edge shallowly concave. Ostium narrow with a raised portion of the genital plate, on each side, fused with the ductus bursae. Ductus bursae strongly sclerotized posteriorly for about one-third of its length, this part swollen at middle; inception of ductus seminalis well before ostium from a small, membranous evagination on the right side of the ductus bursae. Signum a large oval, toothed plate.

Alar expanse, 17–20 mm.

Type.—U.S.N.M. no. 58010.

Type locality.—Fort Lewis, Pierce County, Wash.

Food plant.—Lomatium utriculatum (Nutt.) Coult. & Rose.

Remarks.—Described from the ♂ type and one ♂ and one ♀ paratypes, all from the type locality.

The larvae, from which the type series was reared, were collected April 30, 1944, by the author. At this time the larvae were nearly full fed and entered the soil within a few days after being collected. The first larva pupated May 5, but this specimen died. The moths emerged May 29 and 30, 1944.

The host plants on which these specimens were collected were growing on the prairie, 6 miles east of the main gate of Fort Lewis, in an oak–fir–Scotch broom association.

The larvae of this and the foregoing species are almost identical, but those of *besma* may be distinguished from larvae of *moya* by the absence of any brown coloring on the lateral edges of the thoracic shield.

The moths are immediately distinguishable by several characters: The thorax of *besma* is buff colored and that of *moya* ocherous. The outer discal spot of *moya* is ocherous and there is no pink tinge along the costa as in *besma*.

In the male genitalia the anellus of *besma* is broader than long, but that of *moya* is longer than broad. The most conspicuous difference between the two, however, is found in the basal process of the sacculus which is sharply angulate in *besma* and gently excurved in *moya*. In the females the signum of *moya* is large and square, that of *besma* is oval.

Larvae preserved in the U. S. National Museum.

Like the foregoing species *besma* keys to the same place in the color key, and can be separated from *angustati* and *multifidae* in the same manner. The separation of *moya* and *besma* is discussed above. The genitalia of *besma* differ from those of *angustati* and *multifidae* in the same manner as do those of *moya*.

Depressaria thustra, n. sp.

Figs. 7–7a, 14

A medium-sized dark species nearest *togata* Walsingham.

Labial palpus with second segment ocherous-white speckled exteriorly with black and suffused with purplish fuscous in the brush; third segment blackish fuscous except the tip which is pale ocherous. Head ocherous-brown, the scales whitish tipped; face buff. Thorax and tegula ocherous shaded with blackish fuscous anteriorly. Forewing blackish fuscous with scattered ocherous scaling, especially along costa; base of wing black, except for ocherous scaling at costa; discal spot at end of cell ocherous edged with black; in cell, at basal fourth, an oblique black dash, between this and the outer discal spot an ill-defined line of black and ocherous scales; veins indistinctly indicated by a few black scales; around termen there is an indistinct row of small black spots; costa tinged with pink; cilia light fuscous, darker basally. Hind wing gray, darker toward margins; cilia very pale grayish fuscous with darker subbasal and subterminal bands. Legs buff heavily overlaid with fuscous and mixed with ocherous. Abdomen buff overlaid with grayish fuscous.

Male genitalia.—Harpe moderately long, gradually tapered to the bluntly pointed cucullus; clasper very slender, sharply excurved at distal end; basal process from sacculus finely spinulate, twisted and sharply pointed. Anellus broader than long, roughly bell-shaped. Aedeagus long, curved, pointed, with a small flattened dorsal process and broad flat ventral process at base. Vinculum narrow but broadened at middle. Transtilla narrow, weakly sclerotized, with poorly developed lobes.

Female genitalia.—Genital plate narrow, convex anteriorly at middle, without sclerotized anterior pockets; ostium slitlike. Ductus bursae membranous before ostium, then curved into a strongly sclerotized section, the latter ending about middle of ductus; inception of ductus

seminalis just before ostium. Signum a large, toothed, diamond-shaped plate.

Alar expanse, 18–22 mm.

Type.—U.S.N.M. no. 58009.

Type locality.—Gilmer, Klickitat County, Wash.

Food plant.—Lomatium triternatum macrocarpum (Coult. & Rose) Mathias.

Remarks.—Described from the ♂ type, 5 ♂ and 9 ♀ paratypes all from the type locality, collected by the author. Paratypes in the U. S. National and British Museums.

The larvae from which this series was reared were collected in the small village of Gilmer where the food plant was growing abundantly in an open field. The preponderance of larvae feeding in this locality were this species, but those found on the same plant a mile farther east were all *betina*. These larvae, like those of *betina*, feed in the umbels of the host.

This species is nearest *togata*, but differs from it by the evenly curved, thin, hooked clasper and by the twisted basal process from the sacculus. The sclerotized pockets from the anterior edge of the genital plate are absent in this species. The female of *togata* is not known.

In my color key *thustra* goes to the *angustati-multifidae* couplet. The darker color and the ocherous scaling of the forewing should separate *thustra* from the other two.

Depressaria togata Walsingham

I have examined the type ♂ which is in the Walsingham Collection of the British Museum. This specimen is labeled "Arizona" Morrison, 1882, and this locality was entered in the accession book by Durrant under number 35332 when the type was registered. According to Mr. Stringer, who worked with Durrant and Walsingham, and with whom I have discussed the matter, the locality was entered correctly and the type name, printed in caps, establishes beyond doubt the authenticity of the type specimen.

In publishing the description of this species[5] the type locality was recorded as Montana. In recording the type locality in my revision from the original publication I used the locality given. This should be changed to read ARIZONA.

[5] Insect Life 1: 254. 1889.

Inga sparsiciliella (Clemens)

A single specimen of this species was submitted for determination through the port of entry at Laredo, Tex. The specimen is from San Luis Potosí, Mexico, and was reared from orchids. This is the first association of *sparsiciliella* with a food plant and is the first record for Mexico.

Genus Garrha Walker

Garrha Walker, *List of the specimens of lepidopterous insects in the collection of the British Museum* 35: 1835. 1866. (Genotype: *Garrha sincerella* Walker.)

I have examined the female type of *sincerella* in the British Museum and have found several characters by which it is distinguishable from *Machimia tentoriferella* Clemens, the genotype of *Machimia*, with which Meyrick synonymizes *Garrha*.

In the hind wing of *tentoriferella* vein 5 is remote from connate 3 and 4; in *sincerella*, 4 and 5 are approximate.

The abdomen of the type was glued on but a comparison of its genitalia with other specimens of *sincerella* indicate the abdomen is the original. The abdomen is strongly spined. The signum is present.

The above characters will separate this genus from *Machimia* and I hereby remove *Garrha* from the synonymy.

Genus Hoplomorpha Turner

Hoplomorpha Turner, Proc. Linn. Soc. New South Wales 41: 373. 1916. (Genotype: *Cryptolechia abalienella* Walker, *List of the specimens of lepidopterous insects in the collection of the British Museum* 29: 762. 1864.)

This genus has been synonymized with *Machimia* by Meyrick. A study of the genotype *abalienella* shows that it possesses several characters by which it can be distinguished from *M. tentoriferella*, the genotype of *Machimia*.

In the forewing of *abalienella* veins 2, 3, and 4 are closely approximate; in *tentoriferella*, 2 is remote from 3. The discocellulars of the hind wing of *tentoriferella* are inwardly oblique but in *abalienella* they are straight except between 6 and 7.

The male genitalia of *abalienella* differ from those of *tentoriferella* in the following respects: The gnathos is unspined, long, slender, and curved. Vesica unarmed. The elements of the

transtilla and anellus are fused strongly to the middle of the harpe. Clasper divided. Abdomen strongly spined.

The female genitalia differ in having the signum present and the ductus bursae unsclerotized.

For the above reasons I am removing *Hoplomorpha* from the synonymy under *Machimia*.

In character the genitalia strongly suggest *Garrha* and this genus may be synonymous with *Hoplomorpha*.

Cryptolechia trigama Meyrick

Cryptolechia trigama Meyrick, *Exotic Microlepidoptera* **3**: 476. 1928.

The unique male type, from Fort Davis, Tex., is in the British Museum. I expressed doubt (p. 224) about the proper placement of this species when I assigned it to *Inga*, and a study of the type proved my misgivings were fully justified. Meyrick's species is not an *Inga* nor does it belong to any other genus now recorded from North America.

In venation it agrees with *Machimia* except 7 goes to apex and the termen is more rounded; but the ciliations of the antenna are shorter and more numerous. In *trigama* the second segment of the labial palpus is smooth in front, in *M. tentoriferella* it is rough.

The genitalia of the type of *trigama* are badly damaged but the clasper is absent, anellus with fleshy, flattened lateral processes extending beyond costa of harpe at base, cornuti (2) present. The gnathos and tegumen are missing. Abdomen not spined.

Although the generic placement of this species is still in doubt it would be unwise to add to the confusion by making another assignment until adequate material is obtained.

Cryptolechia diligenda Meyrick

Cryptolechia diligenda Meyrick, *Exotic Microlepidoptera* **3**: 477. 1928.

In placing this species as a synonym of *Himmacia huachucella* (Busck) I was entirely wrong.

Although Meyrick's short, specific description fits *huachucella* as well as *diligenda* the two are not congeneric, nor is *diligenda* congeneric with the genotype of *Cryptolechia*.

Meyrick's species is represented by a unique female in the British Museum, which I have examined, but until such time as the many oecophorid genera of South America are studied or we have obtained adequate material of this species from southwestern United States, the original generic placement should be used.

For the above reasons I am removing *diligenda* from *Himmacia* where I had placed it.

Genus **Thema** Walker

Thema Walker, *List of the specimens of lepidopterous insects in the collection of the British Museum* **29**: 802. 1864. (Genotype: *Thema brevivitella* Walker.)

On page 231 I expressed doubt that *Thema* and *Pleurota* were synonymous. An examination of Walker's type in the British Museum, revealed several differences between the genotypes of the two genera. *T. brevivitella* has a long, upturned terminal segment of the labial palpus; in *P. bicostella* (Clerck) the palpus is porrect. On the anellus of *brevivitella* there are no lateral processes and the vesica is strongly armed (a long, spiraled cornutus). The signum is present, but very weak, in *brevivitella* and the ductus bursae is not sclerotized at any point. The abdomen is spined as in *bicostella*.

Unquestionably *Thema* is closely related to *Pleurota* but the generic term *Thema* must be restricted to *brevivitella* and its congeners and is hereby removed from synonymy.

Genus **Phryganeutis** Meyrick

Phryganeutis Meyrick, Proc. Linn. Soc. New South Wales **9**: 742. 1884. (Genotype: *Phryganeutis cinerea* Meyrick.)

Phryganeutis has been synonymized with *Pleurota* but its type differs in several respects from *bicostella*.

The terminal segment of the labial palpus of *cinerea* is long and upturned, the clasper of the harpe is strongly developed, uncus present but reduced, and the gnathos is long and beaklike. The abdomen is spined.

For the above reasons I am removing *Phryganeutis* from the synonymy under *Pleurota*.

Genus **Atheropla** Meyrick

Atheropla Meyrick, Proc. Linn. Ent. Soc. New South Wales **9**: 758–759. 1884. (Genotype: *Atheropla melichlora* Meyrick.)

On page 271 I placed this genus as a synonym of *Eumeyrickia*, following Meyrick, but expressed doubt that the synonymy was correct.

Meyrick's type, which I have seen, belongs in the Oecophoridae, not Ethmiidae as it would

if a synonym of *Eumeyrickia*. The type of *A. melichlora* is in good condition. The abdomen is strongly spined as in *Pleurota*, the venation is the same except 2 is nearer 3 in the forewing in *Pleurota* than it is in *Atheropla*, and the palpi of the latter are upturned, not porrect as in *Pleurota*. In the hind wing of *melichlora* the discocellulars are inwardly oblique, as in *Pleurota*, from connate 3 and 4 and 5, 6, and 7 are almost parallel.

The bursa of *melichlora* is without signum and is simple.

Atheropla is distinct from *Eumeyrickia* and I am removing it from the synonymy of that genus. Whether or not it is synonymous with some Australian or other genus must await the study of the other genera.

Genus **Paratheta** Lower

Paratheta Lower, Proc. Linc. Soc. New South Wales **24**, pt. 1: 100. 1899. (Genotype; *P. ochrocoma* Lower, ibid. [Fletcher, Mem. Dept. Agr. India, ent. ser., **11**: 164. 1929 (subsequent designation)].)

Mixodetis Meyrick, Trans. Royal Soc. South Australia **26**: p. 172. 1902. (Genotype: *Paratheta ochrocoma* Lower, Proc. Linn. Soc. New South Wales **24**, pt. 1: 100. 1899 [Fletcher, Mem. Dept. Agr. India, ent. ser., **11**: 141. 1929, subsequent designation].) (New synonymy.)

When Meyrick proposed the name *Mixodetis* for *P. ochrocoma* Lower and *P. calyptra* Lower he omitted any reference to *P. lasiomela*, the third species included by Lower in his genus *Paratheta*.

Fletcher, following Meyrick, cited the type of *Mixodetis* Meyrick as *P. ochrocoma* Lower. Thus *Mixodetis* Meyrick becomes a synonym of *Paratheta* Lower.

Paratheta Lower was not described but three species (*P. calyptra*, *P. ochrocoma* and *P. lasiomela*) were described in the genus thus establishing the name.

Meyrick used the name *Paratheta* for the three species *P. syrtica*, *P. spodostrota* and *P philoscia* and designated *P syrtica* as the genotype. *Paratheta* Meyrick is a primary homonym of *Paratheta* Lower and for *syrtica* and its congeners I propose the name:

Pseudotheta, nom. nov.

Paratheta Meyrick (*not* Lower), Trans. Royal Soc. South Australia **26**: 173. 1902. (Genotype: *P. syrtica* Meyrick, ibid. [original designation].)

The type of *P. syrtica* (Meyrick) is in the Meyrick collection in the British Museum. Since Meyrick did not designate types I have selected as the lectotype a specimen from the type series from Sydney, New South Wales (6-9-84). This is a ♂ of which I have made a genitalic preparation. The species is referable to the Oecophoridae and is *not* related to *P. ochrocoma* Lower and its congeners.

The abdomen of *syrtica* is strongly spined. Harpe simple, without clasper. Uncus pointed. Gnathos spoon-shaped, short. Aedeagus stout, curved, sharply pointed, the distal end somewhat flattened.

Family Cosmopterygidae

Anoncia aciculata (Meyrick), n. comb.

Borkhausenia aciculata Meyrick, *Exotic Microlepidoptera* **3**: 468. 1928.

This species is referable to the genus *Anonica* as a study of the genitalia of the type reveals.

Aedeagus very long, slender, curved. Harpe rather long, rectangular; basal process of right harpe digitate, slender. Gnathos long, slender, sharply pointed and slightly curved ventrad distally. From the fused basal portion of harpes a stout, tubular, strongly sclerotized process tapers to a needlelike point.

Anoncia astigmatica (Meyrick), n. comb.

Paratheta astigmatica Meyrick, *Exotic Microlepidoptera* **3**: 467. 1928.—Gaede, *in* Bryk; *Lepidopterorum catalogus*, pt. **88**: 41. 1938.—McDunnough, *Check list of the Lepidoptera of Canada and the United States of America* (pt. 2, Microlepidoptera), No. 8368, 1. 1929.—Clarke, Proc. U. S. Nat. Mus. **90**: 39. 1941.

This species was described and placed in the Oecophoridae by Meyrick, but on characters of wing venation and the genitalia it is clearly a cosmopterygid. Meyrick's concept of the Oecophoridae was sufficiently broad to include this species but since it combines characters of both *Triclonella* Busck and *Anoncia* Clarke its transfer to the Cosmopterygidae is mandatory.

Until the Cosmopterygidae are thoroughly studied I am transferring *astigmatica* to *Anoncia* with which it agrees on all but one character of the male genitalia.

ENTOMOLOGY.—*A correction and two new races in* Graphognathus *(white-fringed beetles) (Coleoptera: Curculionidae).*[1] L. L. BUCHANAN, U. S. Bureau of Entomology and Plant Quarantine. (Communicated by C. F. W. MUESEBECK.)

The name *Naupactus leucoloma* Boheman, or *Pantomorus (Graphognathus) leucoloma* (Boheman), has become familiar to entomologists of this country as specifying one of several closely related South American weevils, collectively known as white-fringed beetles, which are now established in the southeastern part of the United States. The recognition of the supposed *leucoloma* in North America dates from 1936, when I so identified specimens collected in that year near Svea, Fla. Through the courtesy of René Malaise, of the Stockholm Museum, I have recently had the opportunity of studying the type specimen of *Naupactus leucoloma* Boheman, and there can be no doubt that my 1936 identification was wrong and that this species, in its restricted sense at least, does not occur in the United States. As the "*leucoloma*" of North American entomological literature is now without a valid name, it is described as new in this paper. Another white-fringed beetle, discovered in North Carolina in 1942, is also described here for the first time.

Although no satisfactory way of classifying the white-fringed beetles as a whole has yet been worked out, it can be said that, of the seven distinguishable kinds present in the United States, two (*peregrinus* and *minor*) are sufficiently distinct to be regarded as species. The other five, however, along with the true *leucoloma* and many similar though still undescribed segregates from South America, exhibit exceedingly close and peculiarly involved relationships, and though these segregates are isolated from one another by parthenogenesis, it now seems evident that they are not species in the ordinary sense of the word; and in the present paper they are treated as races of the *leucoloma* complex. In addition, *Graphognathus*, formerly considered a subgenus of *Pantomorus*, is raised to generic rank. On such a plan the species and races of *Graphognathus* now known from the United States may be tabulated as follows, the true *leucoloma* of Boheman being included for purposes of comparison:

1. Rostrum distinctly tapering anteriorly, eye more convex (Fig. 12), lateral costa of dorsum of rostrum feebly prominent and not overhanging side of rostrum; median dorsal groove of head and rostrum with its apical portion not or faintly carinate and at most about twice as wide as basal portion, the scales each side of posterior half of groove broadly subovate and lying transversely or transverso-obliquely and in general directed toward midline (Fig. 17); scales and setae along posterior half of midline of pronotum directed posteriorly (Fig. 25); scales on disc of elytra subcircular or broadly ovate and nearly covering surface, the strial lines scarcely perceptible; a narrow bevel present on apex of hind tibia (Fig. 21). Length, 7–10.5 mm. Southern MISSISSIPPI: Harrison, Hancock, Pearl River, Jackson, Stone, Forrest, Covington, Simpson, and Hinds Counties. Southern ALABAMA: Grand Bay, Theodore, and Mobile . . . . . *peregrinus* (Buchanan)

   Rostrum not or less strongly tapering anteriorly, eye less convex (Figs. 9–11), lateral costa of dorsum of rostrum more prominent and more or less distinctly overhanging the side of rostrum just beneath it; median dorsal groove of head and rostrum with its apical portion carinate or not carinate and often considerably more than twice as wide as basal portion, the scales each side of posterior half of groove narrowly ovate to linear and lying longitudinally or longitudino-obliquely, the oblique ones directed toward side margins (Fig. 16); scales and setae along midline of pronotum directed anteriorly in general (Fig. 26); scales on disc of elytra oblong to broadly ovate and not covering surface so completely, the strial lines (except *pilosus*) more evident; hind tibia without distinct bevel (Fig. 22) except in *minor* 2

2. A distinct bevel present on apex of hind tibia (Fig. 20); setae on disc of pronotum appressed or nearly so; eye slightly less convex (Fig. 10); widened apical portion of rostral groove carinate; body shape characteristic (Fig. 2). Length 6.5–10.5 mm. Northwestern FLORIDA: Pensacola, Gonzalez, Cantonment, Bluff Springs, and Century. A single specimen at hand is labeled "Crestview, Fla.," but this locality is doubtful. *minor* (Buchanan)

   Bevel absent or virtually so (Fig. 22); setae on disc of pronotum, at least in part, sufficiently

[1] Received December 3, 1946.

elevated to be easily perceptible and sometimes conspicuous; eye a little more convex (Figs. 9 and 11); rostral groove carinate or not carinate (*leucoloma* complex).....3

3. Rostrum subevenly tapering from base to apex (Fig. 9); elytral intervals broadly but distinctly convex; widened portion of rostral groove carinate; setae on disc of pronotum numerous, slantingly suberect, and rather conspicuous; scutellum slightly impressed; prevailing color rather dark, about as in *dubius* and *striatus*. Length of type 10.5 mm. Tucuman, Argentina. Not in United States. (Fig. 3)....*leucoloma leucoloma* (Boheman)

Rostrum not tapering as above (Fig. 11); elytral intervals less convex or flat; other characters differing with the race.....4

4. Scales on disc of elytra, except on the short basal slope, subevenly spread over the intervals and strial rows, the latter thus being obscured; erect elytral setae a little longer and finer; rostral groove usually without carina, occasionally with a short, faint carina beginning at apex, but usually not extending posteriorly as far as middle of widened part of groove. Length 8–11.3 mm. Definitely known only from Monroe, Conecuh, and Wilcox Counties, Alabama. (Fig. 4)

leucoloma pilosus (Buchanan)

Scales on disc of elytra more concentrated on intervals than along strial rows, the latter, though often feebly defined, more evident than in *pilosus* and usually appearing to the unaided eye as parallel lines which are more or less distinctly darker than the intervals (Figs. 5–8); erect elytral setae a little shorter and stiffer; rostral groove carinate or not carinate, the carina, when present, usually longer than in *pilosus*.....5

5. Rostral groove carinate anteriorly; strial lines usually a little darker and more distinct; prevailing color brownish, darker.....6

Rostral groove not carinate; strial lines less distinct; prevailing color gray or gray-brown, lighter.....7

6. Elytra more strongly widened posteriorly (Fig. 6), intervals 2 and 4 not or scarcely perceptibly paler than adjacent intervals; prothorax narrower (see paragraph following key); metasternum more convex (Fig. 24). Length 9–12.7 mm. Southeastern LOUISIANA: Many localities in St. Bernard, Plaquemines, Jefferson, Orleans, St. Tammany, Tangipahoa, East Baton Rouge, and Iberia Parishes. Southern MISSISSIPPI: Harrison, Pearl River, Lamar, Forrest, Jefferson Davis, Jones, and Hinds Counties. Southern ALABAMA: Luverne, Chilton, and Grand Bay. GEORGIA: Many localities between Cornelia on the north and Irwinville on the south, and between Columbus on the west and Sylvania on the east. SOUTH CAROLINA: Columbia. The localities Pensacola, Fla., and DeLisle, Miss. (one specimen each), require confirmation

leucoloma striatus (Buchanan)

Elytra little widened posteriorly, sides usually appearing subparallel (Fig. 5), intervals 2 and 4 in apical halves often paler than adjacent intervals, prothorax broader; metasternum less convex. Length 8.5–12.2 mm. Southern MISSISSIPPI: Moss Point (these specimens were formerly placed with *striatus*), Maxie, Hattiesburg, and Camp Shelby. Southern ALABAMA: Mobile, Toulmanville, Blakeley Island, Crichton, Prichard, Irvington, Foley, Peterman, Natchez, Buena Vista, Tunnel Springs, Martins Station, and Selma. Northwestern FLORIDA: Century. NORTH CAROLINA: Peachland, Marshville, Polkton, and Burgaw. A few specimens, not positively identifiable though probably belonging to *dubius*, are labeled "Nadawah" and "Neenah, Ala.," and "Gulfport, Miss."

leucoloma dubius (Buchanan)

7. Size slightly smaller; scales and setae along midline of pronotum in general directed anteriorly or somewhat obliquely, a few of those in a small area about midpoint sometimes dearranged and pointing in various directions (Figs. 13 and 19); metasternum less convex (Fig. 23). Northwestern FLORIDA, southern ALABAMA, and southern MISSISSIPPI.....*leucoloma fecundus*, new race

Size a little larger; scales and setae along midline of pronotum about as in *fecundus* except in a small area near midpoint where many of them often lie either transversely, or at least more strongly obliquely than in *fecundus* (Fig. 14); prothorax broader (see paragraph following key); metasternum slightly more convex. NORTH CAROLINA

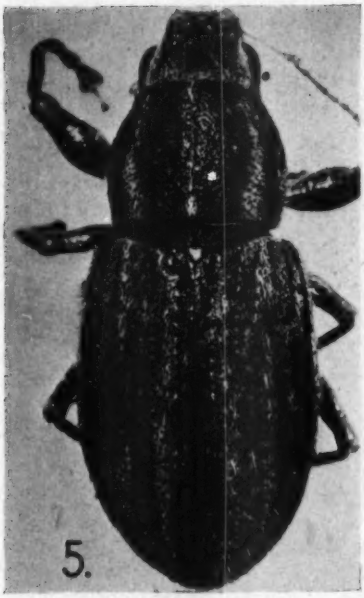
leucoloma imitator, new race

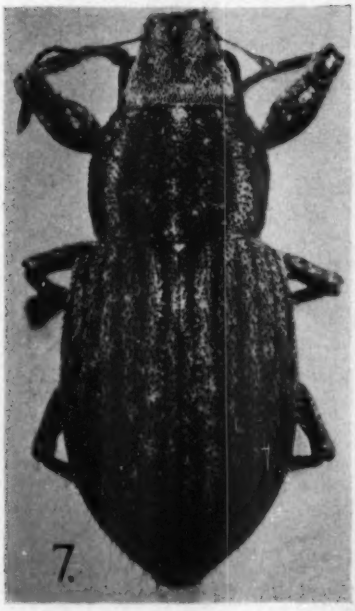
The mean ratio of the length of the prothorax divided by its breadth for the preceding five races is as follows, the figures in parenthesis indicating the number of specimens measured: *pilosus*, 0.800 (48); *striatus*, 0.828 (216); *dubius*, 0.801 (357); *fecundus*, 0.756 (408); *imitator*, 0.744 (256).

The distribution in South America of the white-fringed beetles present in the United States is still very imperfectly known. Three of them (*dubius*, *pilosus*, and *imitator*) have not been definitely recognized among the South American collections at hand. Of the others, a single old specimen of *striatus*, labeled "Cordoba" [Argentina], agrees closely with certain small specimens of this race from the United States; a specimen, almost certainly of *fecundus*, was collected at San Antonio, Uruguay,

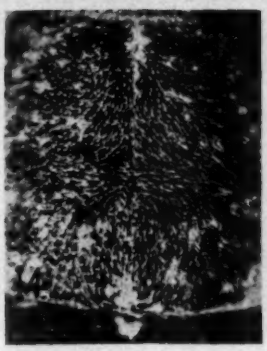
GRAPHOGNATHUS

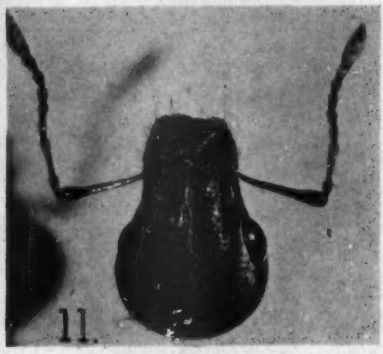
FIGS. 1–4.—1, *peregrinus*, Gulfport, Miss.; 2, *minor*, Cantonment, Fla.; 3, *leucoloma leucoloma*, type, Tucumán, Argentina; 4, *leucoloma pilosus*, Repton, Ala. Photographs by M. L. F. Foubert.

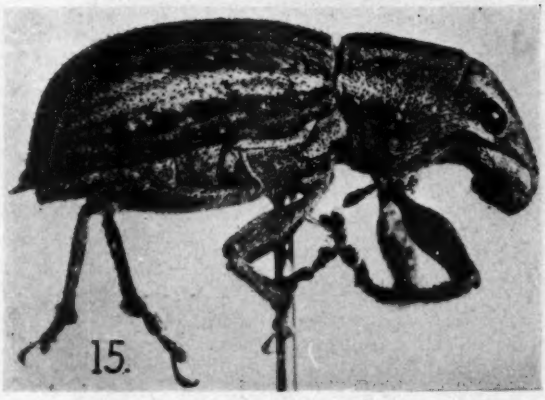




FIGS. 5–8.—5, *leucoloma dubius*, Mobile, Ala.; 6, *leucoloma striatus*, New Orleans, La.; 7, *leucoloma fecundus*, Florala, Ala.; 8, *leucoloma imitator*, Wilmington, N. C. Photographs by M. L. F. Foubert.

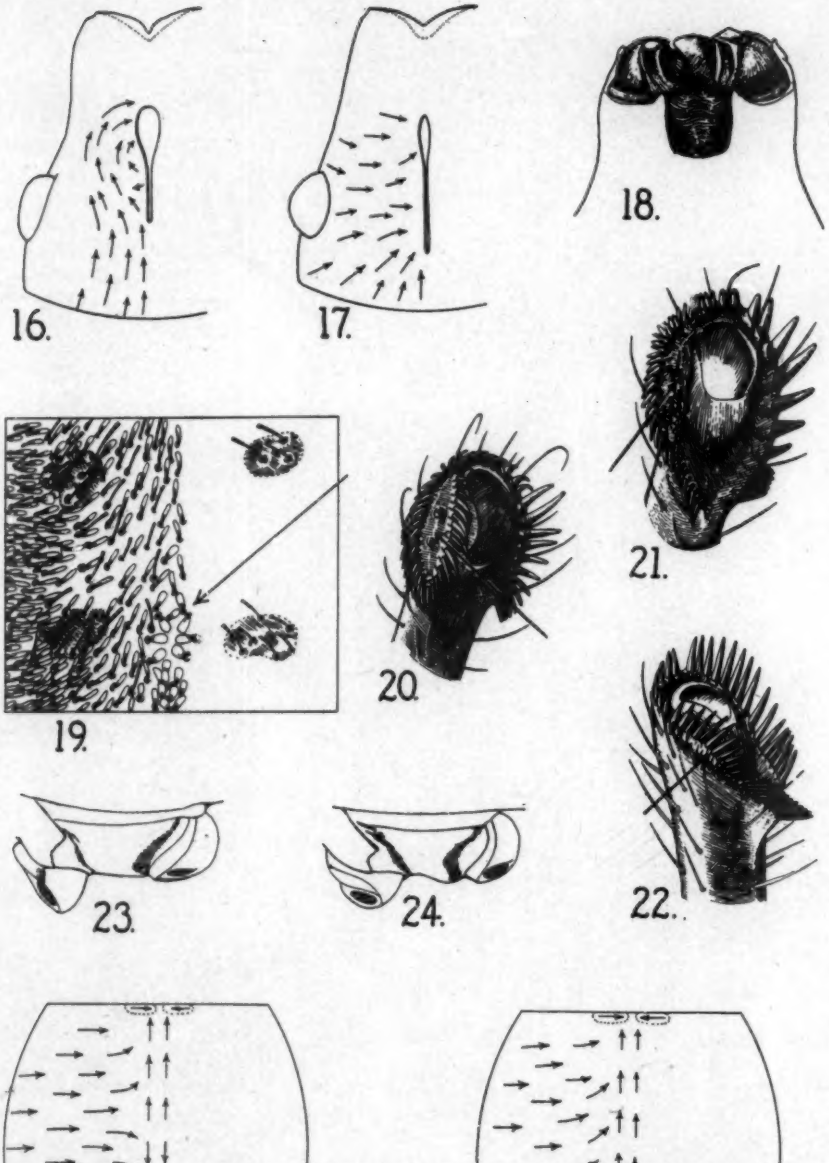






GRAPHOGNATHUS

FIGS. 9–15.—9, *leucoloma leucoloma*, dorsal view of head; 10, *minor*, same; 11, *leucoloma fecundus*, same; 12, *peregrinus*, same; 13, *leucoloma fecundus*, median area of pronotum, showing directional trend of vestiture; 14, *leucoloma imitator*, same, specimen having the transverse arrangement of vestiture near midpoint unusually well developed; 15, *leucoloma fecundus*, side view. Photographs by M. L. F. Foubert.



FIGS. 16–26.—(See opposite page for legend).

by Paul Berry; a few specimens of *peregrinus* were collected at Santa Fé, Argentina, by H. L. Parker; and a specimen of *minor* was taken at Buseo, Uruguay, by Silveira. Of the true *leucoloma* of Boheman I have seen only one specimen, the type, labeled "Tucuman."

Graphognathus leucoloma fecundus, n. race

Figs. 7, 11, 13, 15

Naupactus leucoloma North American authors, not Boheman; *Pantomorus (Graphognathus) leucoloma* Buchanan, U. S. Dept. Agr. Misc. Publ. 341: 12. 1939; Bull. Brooklyn Ent. Soc. 37: 110. 1942, not *leucoloma* Boheman; *Pantomorus leucoloma* North American reports.

Length 8–12 mm; width 3.4–5.6 mm. Prevailing color above gray or gray-brown, the elytra sometimes feebly variegated with irregular gray and brown splotches. Elytra with scales usually dense on intervals, less dense along strial rows, the scales abruptly paler (pearly white) in a broad lateral stripe beginning on humerus and extending to apex; setae erect or slanting, some of them shorter, more or less curved, and more numerous, the others sparser, much longer, and straight or nearly so. Pronotum with a curved, not sharply defined, sublateral line of pale or whitish scales.

Dorsal surface of rostrum scaly and setose, the median groove broadly dilated anteriorly, the dilated part not carinate; lateromarginal costa shiny, usually bare or nearly so at summit. Prothorax transverse, upper surface with appressed scales ranging in shape from ovate to linear, and with inclined, curved setae, the scales broader and denser laterally than medially, vestiture along midline usually directed longitudinally or somewhat obliquely, except in a small area located usually just posterior to midpoint of pronotum where a few of the scales and setae are sometimes much confused in arrangement and point in various directions. Scutellum usually not impressed. Elytral intervals broadly, feebly convex, often appearing flat. Under side and legs scaly and setose. (For more detailed description see Buchanan, 1939, pp. 11–13.)

Type locality.—Florala, Ala. July 14, 1937. P. N. Annand. On cotton.

Type and 110 paratypes (all from Florala and immediate vicinity and Lockhart, Ala.), No. 58152, United States National Museum.

Specimens in the National Museum collection are from the following localities: Southern MISSISSIPPI: Poplarville and Lumberton. Southern ALABAMA: Geneva County, Florala, Lockhart, Opp, Flomaton, Evergreen, Atmore, Vocation, Foley, Drewry, Burnt Corn, Monroeville, Peterman, Tunnel Springs, Beatrice, Buena Vista, Nadawah, McWilliams, Pleasant Hill, Martins Station, and Dallas County. Northwestern FLORIDA: De Funiak Springs, Glendale, Crestview, Svea, Pensacola, Gonzalez, Bluff Springs, Byrnville, and Century.

A few specimens collected between 1939 and 1941 are labeled "Lake Arthur," "Baton Rouge," "Poydras," and "New Orleans," La., but as no Louisiana specimens have been reported since 1941, the actual establishment of *fecundus* at these places may be doubted. Similarly, the establishment of *fecundus* at Gulfport, Miss. (1 specimen), Hattiesburg, Miss. (1 specimen not now at hand), and at Mobile, Ala. (2 specimens), needs corroboration.

Graphognathus leucoloma imitator, n. race

Figs. 8, 14

Length 8.5–13 mm; width 3.5–6 mm. Prevailing color above gray-brown, size slightly larger than in *fecundus*. Head and rostrum as in *fecundus*, except that the dilated part of median groove on dorsal surface averages a little wider and apparently shallower. Prothorax relatively a little broader and its upper surface somewhat

FIGS. 16–26.—16, Diagram of upper surface of head and rostrum to show directional trend of vestiture in the *leucoloma* complex and in *minor*; 17, same of *peregrinus*; 18, ventral view of rostrum, showing the mandibular sulci of *Graphognathus*; 19, middle of pronotum, showing "area of confusion" (arrow) sometimes present in *lecuoloma fecundus* and in other races of the *leucoloma* complex; 20, *minor*, apex of hind tibia, showing bevel; 21, *peregrinus*, same, the bevel present but not so well defined as in *minor*; 22, same, showing the narrow, feebly defined area, corresponding to a bevel, sometimes present in specimens of the *leucoloma* complex; 23, flat metasternum characteristic particularly of *leucoloma fecundus*; 24, convex metasternum more or less characteristic of *leucoloma striatus*; 25, diagram of pronotum, showing directional trend of vestiture in *peregrinus*; 26, same of *leucoloma fecundus*, and in general of the *leucoloma* complex; also of *minor*. (Area of confusion not indicated; see Fig. 19.) Drawings by Arthur Cushman.

more coarsely sculptured than in *fecundus;* vestiture at or a little behind midpoint of pronotum often transverse or transverso-oblique in direction. Scutellum densely clothed with white scales and more often impressed than in *fecundus.* Otherwise as in *fecundus.*

Type locality.—Wilmington, N. C. July 13, 1942. ACL railroad track. GWRD-47B.

Type and 115 paratypes (all from Wilmington and vicinity), No. 58153, United States National Museum.

Specimens have been examined from the following places in NORTH CAROLINA: Cape Fear, Wrightsboro, Wilmington, Castle Hayne, Rocky Point, St. Helena, Burgaw, Jacksonville, Kellum, Atkinson, Ivanhoe, Bladenboro, Lumberton, Hope Mills, Vander, Warsaw, Goldsboro, Kinston, Dover, and Greensboro.

This race is exceedingly close to *fecundus,* and no uniformly reliable way of separating them is known; and single specimens or small lots of both races can sometimes be identified only by locality. Statistical study of long series, however, indicates that *fecundus* and *imitator* are separate entities, even though they merge more or less imperceptibly in all characters and character combinations. Possibly *imitator* may be something in the nature of a recent mutation of *fecundus* but, if so, there still remains the need, from a taxonomic standpoint, of recording those differences that do exist.

In the many hundreds of specimens of each race examined, the single feature which has proved most useful as a distinguishing mark (though far from an invariable one) is found in the direction taken by the vestiture on and bordering the median line of the pronotum. In most specimens of *fecundus* the vestiture along this line points either longitudinally or slightly mesad (Fig. 13), though in a small area usually located just posterior to the midpoint of the pronotum and which may be termed the "area of confusion" (Fig. 19), there is occasionally a more or less marked dearrangement of the vestiture, in which case some of the setae and scales are more obliquely, or even transversely or backwardly, directed. In general, however, the vestiture along the median line of the pronotum in *fecundus* points longitudinally or nearly so. In *imitator,* especially in medium- and large-sized specimens, the vestiture in the area of confusion is oftener transverse in direction, or more nearly transverse than in *fecundus;* and the number of setae and scales having a transverse or obliquely transverse direction is usually greater than in *fecundus* (Fig. 14). The somewhat coarser pronotal sculpture of *imitator* is also a useful character in series.

HERPETOLOGY.—*A new musk turtle from Southeastern United States.*[1] HOBART M. SMITH and BRYAN P. GLASS, Agricultural and Mechanical College of Texas, College Station, Tex. (Communicated by Herbert Friedmann.)

Included in a small collection of reptiles and amphibians from Mississippi, kindly donated to the Texas Cooperative Wildlife Collections (herein indicated as TCWC) at the Agricultural and Mechanical College of Texas by Helmut K. Buechner, is an adult *Sternotherus* remarkable as the second known example of a species anticipated as long ago as 1895 by Samuel Rhoads, but neglected and confused with *S. minor* by subsequent authorities.

For the use of comparative material without which our study could have come to no satisfactory conclusion, we are indebted to Dr. Doris M. Cochran, of the U. S. National Museum, and Dr. Cornelia Smith, of Baylor University. We are deeply grateful to Helmut Buechner for his kindness in providing the Mississippi material.

Sternotherus peltifer,[2] **n. sp.**

STRIPED MUSK TURTLE

Holotype.—TCWC No. 1205, male, from Bassfield, Jefferson Davis County, 30 miles west of Hattiesburg, Miss., collected on June 4, 1946, by Helmut K. Buechner.

Diagnosis.—A member of the genus *Sternotherus* with a single sharply defined median

[1] Received October 3, 1946.

[2] From Latin: *pelta,* a very short buckler or target in form of a half-moon; *fer,* bearing. Used in reference to the small, slender bridge scutes.

keel, gular plates greatly reduced, and two mental barbels. Similar in these respects to *S. carinatus* from which it differs as follows: (1) axillary and inguinal plates reduced in size, much longer than broad; (2) second, third, and fourth vertebral shields broader than long; (3) humerals short and broad; and (4) carapace relatively rounded in cross section. Most closely related to *S. minor*, from which it differs in lacking lateral keels. Unique in having distinct stripes on head and neck and a pair of gular vestiges.

Description of holotype.—Carapace smoothly and symmetrically oval in dorsal profile, width about 0.75 of length, depth slightly greater than 0.33 of length; rear edge of carapace very feebly flared, not notched medially. Plastron narrow, anterior lobe slightly wider and shorter than posterior lobe (along median line), bridge slightly less than 0.25 of total plastral length. Head moderately large; upper jaw very feebly and lower jaw rather strongly hooked; numerous longitudinal rows of fine papillae on neck; two chin barbels. Tail extending beyond carapace for more than half its length, very slightly unguiculate, tip conical; numerous short fine papillae on tail, dispersed both irregularly and in rows. Rasping organ small, compact, each section oval in outline, very well defined.

Dorsal plates relatively loosely imbricate (as compared with, e.g., *S. odoratus*); first vertebral long and narrow, triangular, apex truncate, greatest width somewhat less than half greatest length; second, third and fourth vertebrals diamond-shaped to pentagonal, deeply overlapping, each a little wider than long; fifth vertebral pentagonal, only slightly longer than broad; costals four, typical, anterior longest, posterior smallest; nuchal very small; marginals eleven on each side, posterior two on each side more elevated than others, none less than about half as high as long, none serrate although posterior edge of each of rear four scutes on either side slightly overhanging anterior edge of succeeding scute. Median plastral sutures extensively and other plastral sutures narrowly bordered by incompletely cornified epidermis. Gular shields vestigial, paired; humerals short, broad; pectorals quadrangular, their median suture more than half as long as their lateral margin. Abdominals quadrangular, the lateral portion extending past the border of the plastron to form the greater part of the bridges. Axillaries and inguinals much reduced, a little more than three times as long as wide, latter twice size of former, together barely serving to separate lateral margins of abdominals from contact with marginals. Femorals and anals quadrangular. Posterior margin of plastron broadly emarginate, sides of emargination forming an angle of about 105°, width about half greatest width of posterior lobe; anterior margin of plastron truncate and slightly indented.

Dorsal scutes dark olive-brown, their free margins outlined with black; obscure, short, dark streaks radiating from posteromedial corner and evident chiefly toward the margin of each scute. Plastral shields yellow, feebly edged with brown; naked skin of plastron whitish. Neck and posterior half of head dark gray-brown, with bright yellow stripes above and on sides averaging 1.5 mm in width (same as dark interspaces), yellow below and with large dark patches. Frontal region with indistinct round dark spots; a few irregular dark spots on anterior temporal region; rostrum and upper jaw clouded, lighter toward lips; lower jaw with longitudinal brown streaks. Superior and anterior surfaces of forlegs dark and with distinct, irregular, longitudinal light streaks; hind legs dark, feebly marked; tail likewise irregularly marked, more clearly toward tip.

Measurements (in mm).—Carapace length 85.7; carapace width (greatest) 63.8; plastral length (median line) 57.9; maximum width anterior lobe 34.2; maximum width posterior lobe 29.6; length anterior lobe 18.7; length posterior lobe 21.9; bridge length 13.1; width of posterior plastral notch 15; depth of notch 4.1; median pectoral suture 11.1; lateral pectoral margin, 17; abdominal width 24.2; inguinal 3×9.5; axillary 1.9×7.8; humerals 6.2×12.2; second vertebral 22.6 (width)×21.2 (length, maximum); third vertebral 23.3×20.1; fourth vertebral 20.8×18.7; fifth vertebral 18.8×19.5.

Discussion.—The species represented by the present specimen is somewhat intermediate in some respects between *S. carinatus* and *S. minor*. It is, however, abundantly different from both and possesses a few distinctive characters of its own. No other described species of *Sternotherus* is known to have the peculiarly marked head and neck, with many well-defined stripes.

However Rhoads (Proc. Acad. Nat. Sci. Philadelphia **49**: 384–386. 1895) describes a specimen from the Emory River at Harriman, Roan County, Tenn., with an apparently identical pattern and similar structure; almost beyond question Rhoads' specimen is referable to *S. peltifer*. If properly allocated, it indicates a considerable range for the species, from eastern Tennessee to southern Mississippi. The eastern and western limits of the range are problematical.

It is noteworthy that Stejneger (Proc. U. S. Nat. Mus. **62** (art. 6): 2–3. 1923) and Pope (Turtles U. S., Canada: 48. 1939) allocate Rhoads' specimen with *S. minor*. The latter species, however, possesses three keels and has a spotted head. Rhoads describes his specimen as being "strongly keeled," and fails to mention lateral keels; likewise he describes stripes on the head. These features are reproduced in the Mississippi specimen.

Perhaps of considerable interest is the fact that *S. peltifer* shares its range with only one other of the genus: *S. odoratus*. It is bordered on the east by *S. minor*, on the west by *S. carinatus*, while *S. odoratus* overlaps the ranges of all three. These facts suggest that *S. peltifer* belongs to the section of the genus including *S. minor* and *S. carinatus*. It is of interest to speculate that these three forms may even be subspecies; if not they appear at least to be members of a single artenkreis.

The probable relationship of *S. peltifer*, *S. minor*, and *S. carinatus* is indicated by more than geographic ranges. They are all of similar superficial appearance (witness the frequent records by early authors of *S. minor* under the name of *S. carinatus*), and of much the same body shape and color. Rhoads' reference of one specimen of *S. peltifer* to *S. carinatus*, while Stejneger and Pope refer the same to *S. minor*, is evidence enough that the several species are confusingly alike. Differences between them are as follows:

S. carinatus: axillary and inguinal plates very large, nearly or quite as broad as long; second, third, and fourth vertebrals longer than broad; humerals very large, their median suture at least two-thirds length of their suture with pectorals; head dark-spotted on a light background; no lateral keels; gular plates absent or vestigial.

S. peltifer: axillary and inguinal plates small, much longer than broad; second, third, and fourth vertebrals broader than long; humerals smaller, their median suture not more than one-half length of their suture with pectorals; head dark-striped on a light background; no lateral keels; gular plates paired, vestigial, much broader than long.

S. minor: axillary and inguinal plates smaller, much longer than broad; second, third, and fourth vertebrals broader than long; humerals smaller, their median suture not more than one-half length of their suture with pectorals; head dark-spotted on a light background; lateral keels present; gular plate single, of normal shape, about as broad as long.

In comparison it can be seen that in the six characters discussed, *S. carinatus* is unique in three, shares one with *S. minor* and two with *S. peltifer*. The latter is unique in one, and shares three with *S. minor*, which in turn is unique in one character. It is obvious that *S. peltifer* is apparently more closely related to *S. minor* than to *S. carinatus*.

S. odoratus, which belongs in another group, has two light lines on each side of the head, more than two chin barbels, very low marginals, and usually a large gular. Its variation is considerable throughout its range, but these characters appear to be relatively constant and indicate relatively little relationship with *S. peltifer*. Since it occurs in the same area as the latter species their relationship is probably not close; they no doubt represent two entirely different artenkreisen.

Specimens examined.—Comparative material available includes the following: *S. minor* (2): Baker County, Ga. (Baylor Univ. No. 2058); Mimsville, Baker County, Ga. (Baylor Univ. No. 2059). *S. carinatus* (25): Mississippi: Black River Crossing (near Vicksburg?) (U.S.N.M. nos. 59958–60). Louisiana: Hope Villa (= Bullion), Ascension Parish (U.S.N.M. nos. 64603–13); Mermentau, Acadia Parish (U.S.N.M. no. 100095); Mermentau River, opposite Mermentau, Jefferson Davis Parish (U.S. N.M. no. 100094). Texas: Black Lake (17 miles NNE. of Bryan) and Wickson Lake, Brazos County (TCWC, 3); Tom Bull, Harris County (TCWC, 1); Twin Lakes, Madison County (TCWC, 4); 3 miles east of Evergreen, San Jacinto County (TCWC, 1).

ORNITHOLOGY.—*The southernmost race of the white-browed rufous piculet.*[1] Deignan, U. S. National Museum.

Some time ago (U. S. Nat. Mus. Bull. 186: 254. 1945) I suggested that the population of *Sasia ochracea* resident in southern Tenasserim and peninsular Siam at the Isthmus of Kra would require separation from more northern birds by virtue of the color of its orbital skin, but then refrained from naming it because of doubt as to the characters of *S. o. reichenowi*, described from central Tenasserim. There is now good evidence for the belief that the name *reichenowi* must be employed for the birds tentatively identified as *querulivox* (*loc. cit.*, pp. 253–254), and since the southernmost race is thus left without a name, I propose that it be called—

Sasia ochracea hasbroucki, n. subsp.

Type.—Adult female, U.S.N.M. No. 173000, collected at Maliwun, Mergui District, Tenasserim Division, Burma, on March 22, 1900 by William Louis Abbott.

Diagnosis.—From *S. o. reichenowi* (Thayetchaung, Tavoy District, Tenasserim), separable by its much more robust bill and by having the naked skin of the orbital region blackish or slaty (in the type "leaden") instead of deep crimson or crimson-like.

Range.—From the Isthmus of Kra and the shores of the Pak Chan Estuary north (at least on the eastern side of the Malay Peninsula) to (apparently) about latitude 12°30′ N.

Remarks.—Study of numerous species has shown that the birds resident in the adjoining districts of Tavoy and southwestern Siam are racially inseparable. Since it is now known that the population of the latter area comprises red-orbited birds of the northern type, it may be asserted with confidence that topotypes of *reichenowi* will be the same.

I have before me only two specimens from Maliwun, but four others from the Isthmus of Kra have been reported by Robinson and Boden Kloss (Journ. Nat. Hist. Soc. Siam **5**: 201. 1923) as having the "orbits black, blackish red, dark slate or slate."

Meyer de Schauensee (Proc. Acad. Nat. Sci. Philadelphia **98**: 38. 1946) has recorded two specimens from Ban Kaeng Sok (at about latitude 12°40′ N.) as having the orbital region black but the bill slender rather than robust. Since they come from a place at a latitude just halfway between those of Thayetchaung and Maliwun, it would appear that the two races intergrade in this vicinity.

The new woodpecker is named for my friend Edwin M. Hasbrouck, M.D., a volunteer worker in the Division of Birds, United States National Museum.

[1] Published by permission of the Secretary of the Smithsonian Institution. Received January 2, 1947.

PHILOSOPHICAL SOCIETY

1253d Meeting

The 1253d meeting was held in the Cosmos Club Auditorium, October 13, 1945, President WAIT presiding.

Program: ARTHUR E. RUARK, Naval Research Laboratory: *A plan for scientific progress in pure physics.*—Attention was called to the haphazard methods that have prevailed in building up our fundamental picture of the physical universe. All too often great discoveries have been made against odds, by individuals working with meager resources. Nothing can replace the insight of the gifted investigator. Nevertheless the suggestion is made that by *group* effort general plans can be made for the advancement of pure physics—plans that would provide favorable conditions for rapid progress.

To make this point clear, the current situation in two broad fields of investigation was surveyed, and lines of advance feasible in the immediate future were indicated. These fields are:

(1) The discovery of additional fundamental particles.

(2) The interaction of fundamental particles with each other.

Reasons were advanced for the belief that many elementary particles and combinations of elementary particles remain to be discovered, and that some of them may be found by methods now available. The free magnetic pole was cited as an example. The incompleteness of our knowledge of the interactions between known particles was discussed. Studies of the electron-electron collision at North Carolina were described to illustrate the fact that many man-years must still be devoted to this fundamental problem.

It was pointed out that a very light atom composed of one electron and one positron must exist. The name "positronium" was proposed for this entity. The detection and study of this atom would provide very desirable checks of the theory of hydrogenic atoms in general, and of the interaction of electrons and positrons in particular.

To insure systematic, continuous attack on such essential problems, it was proposed that a number of institutes devoted to pure physics should be established, with a life of five years, and no more. At the end of that time the scientific personnel of the institute would be required to make other connections in order to spread their influence into other institutions—academic or commercial, as the case might be. The general scientific position would be reassessed and another group of five-year institutes would be launched with fresh personnel. The business of the institutes would be *discovery*, not application of discoveries. (*Author's abstract.*)

1254th Meeting

The 1254th meeting was held in the Cosmos Club Auditorium, October 27, 1945, President WAIT presiding.

Program: T. CASPERSON, Karolinska Institutet, Stockholm, Sweden: *Cytochemical studies of protein metabolism in mammalian cells.*

1255th Meeting

The 1255th meeting was held in the Cosmos Club Auditorium, November 10, 1945, President WAIT presiding.

Program: WADE H. MARSHALL, Johns Hopkins University: *The dynamics of the central nervous system with special reference to vision.*—Electrical examination of the sensory systems has garnered much information concerning physiological operation and anatomical organization. The primary sensory systems from periphery to cortex exhibit continuous activity and sensitivities near the noise level of the environment. One type of activity is the alpha rhythms. They are typically observed in cortical neurones when attention processes are relaxed, show some characteristics of relaxation oscillators, and are sufficiently orderly that Fourier analysis has been useful. The neurones which conduct and elaborate the impulses from the periphery show some similar rhythmicity, and, in general, time functions of activity are clearly revealed by examination of the systems by definitely patterned stimuli sequences. An excitability cycle is then revealed which exhibits a major phase, the duration of which is

the same order of magnitude as the fundamental alpha rhythm of the cortex.

A single stimulus repeated at fixed intervals elicits a local response at the cortex and by this means the projection of the periphery on the cortex has been mapped out, adding a wealth of detail to the knowledge of anatomical organization and introducing new facts and concepts to anatomy, physiology, and phylogeny.

When the time dimension in the stimuli pattern is further examined it is seen that interaction among contiguous neurones occurs in the reciprocally overlapping and multiplying pathways of the ascending neurones of the visual system. This interaction operates to transmit and enhance minor activity gradients on the retina while integrating lines and areas. This mechanism is directly applicable to the problem of vernier acuity and contour discrimination. Theoretical considerations extend to other problems such as the bipartite field. (*Author's abstract.*)

Mr. H. B. MARIS presented an informal communication on cycle analysis.

1256th Meeting

The 1256th meeting was held in the Cosmos Club Auditorium, November 24, 1945, President WAIT presiding.

Program: JOHN KRANTZ, Department of Pharmacology, University of Maryland: *The mechanism of action of anti-bacterial drugs.*—The historical development of the arsenical drugs was considered with special emphasis on their mechanism of action. The sulfonamides and their application in the treatment of various infectious diseases were reviewed. The discovery of antibiotic substances, such as penicillin and streptomycin, was related with special attention devoted to their mechanism of action. (*Author's abstract.*)

RALPH W. G. WYCKOFF, National Institute of Health: *Shadowed electron micrographs.*—With R. C. Williams, of the University of Michigan, a method has been developed for enhancing the contrast in electron microscopic preparations. This consists in obliquely evaporating a very thin metallic film over the surface in question. Such directed surface staining makes it possible to measure the heights of objects by the lengths of the permanent "shadows" they cast during evaporation, to see fine detail on replicas which otherwise would be too transparent to exhibit the structure they contain and to see the shapes and sizes of objects of macromolecular dimensions. Lantern slides illustrated the application of this shadowing to the examination of replicas of different kinds of surfaces including several prepared for metallographic study, and to the photography of viruses and biological macromolecules. (*Author's abstract.*)

1257th Meeting

The 1257th meeting, constituting the 75th annual meeting, was held in the Cosmos Club Auditorium, December 8, 1945, President WAIT presiding.

The treasurer reported that the income from dues and interest on investments was $1,357.20 and that the expenditures were $1,206.72, leaving a net gain of $150.48 on ordinary expenses. The ordinary expenses were at the rate of $3.45 per member. The total estimated assets of the Society showed an increase of $927.98 during the year to $16,649.19 on December 1, 1945.

The Secretaries' joint report showed an active membership as of December 1, 1945, of 347, of whom the following 19 were new members: LADISLAV BOOR, WILLIAM F. BROWN, VICTOR W. COHEN, DEAN B. COWIE, BERNHARD EPSTEIN, MARTIN GARSTENS, CURTIS L. HEMENWAY, CHARLES A. LITTLE, JR., A. V. MASKET, EDWARD DER MATEOSIAN, RICHARD G. NUCKOLLS, HARRY POLACHEK, ARTHUR E. RUARK, EMIL D. SCHELL, WILLIAM SCHWEDER, JANET SNYDER, ALFRED D. SOLLINS, M. H. TRYTTEN, and FRANCIS VANE.

The Secretaries reported the death of ROY B. HUNTER and M. L. ZIMMER.

Following the report of the Committee on Elections, the following officers were declared elected for the year 1946: *President*, FRANCIS M. DEFANDORF; *Vice-Presidents*, FRED L. MOHLER and WALTER RAMBERG; *Corresponding Secretary*, FRANCIS E. JOHNSTON; *Treasurer*, FRANZ C. KRACEK; *Members-at-Large of the General Committee*, SCOTT E. FORBUSH and JAMES H. TAYLOR.

Program: PAUL F. BARTUNEK, National Bureau of Standards: *The significance of the symbols of physics.*—An attempt was made to clarify the confusion resulting from a failure to appreciate the meaning of words and symbols.

The system developed by Korzybski in his book *Science and sanity* contains a wealth of pertinent material.

The ideas of physics are originally on a nonverbal laboratory level. A language becomes necessary for a description of the phenomena. To be useful in physics and other fields the structure of the language must be similar to the observed phenomena. It is through similarity of structure alone that the language of pure mathematics becomes useful as applied mathematics.

Some common semantic blunders are (Weinberg, Amer. Journ.. Physics 7: 104. 1939):

(1) Substitution of facility in manipulation of symbols for understanding of structural similarity.

(2) Use of symbols whose structure does not correspond to that of the physical referent.

(3) Inability to extend the domain of a physical symbol.

If one is aware at all times that symbols are *not* the things talked about; that not all aspects of a physical situation can be covered by a single symbol, and that what appears as a single symbol represents different aspects in different contexts—he will gain a flexibility of viewpoint which is useful in overcoming these difficulties. (*Author's abstract.*)

1258th Meeting

The 1258th meeting was held in the Cosmos Club Auditorium, January 5, 1946, President DEFANDORF presiding.

The retiring President, G. R. WAIT, of the Department of Terrestrial Magnetism, delivered his presidential address on the subject *Some experiments relating to the electrical conductivity of the lower atmosphere.* This address was published in this JOURNAL (36: 321–343. 1946).

1259th Meeting

The 1259th meeting was held in the Cosmos Club Auditorium, January 19, 1946, President DEFANDORF presiding.

Program: G. H. DIEKE, Johns Hopkins University: *Direct intensity measurements of spectrum lines with phototubes.*

1260th Meeting

The 1260th meeting was held in the Cosmos Club Auditorium, February 2, 1946, President DEFANDORF presiding.

Program: A. V. ASTIN, National Bureau of Standards: *The development of the radio proximity fuze for bombs and rockets.*—Radio proximity fuzes for bombs, rockets, and shells were developed and produced under a joint cooperative program involving OSRD, the Army and Navy, and numerous universities and industrial laboratories. The shell fuze program was the responsibility of the Navy and Section T of OSRD with central laboratories at the Applied Physics Laboratory of Johns Hopkins University. The bomb and rocket fuze program was the responsibility of the Army and Division 4 of NDRC with central laboratories at the National Bureau of Standards.

Radio proximity fuzes are sensitive to approach to a target, either an airplane or the ground, because of the interaction of a transmitter in the fuze with reflected waves from the target (Doppler effect). Sensitivity is determined by radiation characteristics and by properties of an audio frequency amplifier for the interaction signal.

In addition to an oscillator, receiver, and amplifier a proximity fuze requires an electronic trigger switch (thyratron), an electric detonator, a booster, a power supply, and safety and arming features. Tiny wind-driven generators supplied the power for bomb and rocket fuzes and an ingenious wet reserve battery energized the shell fuzes.

Ruggedness and small size were major design requirements. (*Author's abstract.*)

L. R. HAFSTAD, Johns Hopkins Applied Physics Laboratory: *The development of the radio proximity fuze for shells.*—In research one struggles hard to make apparatus that can work. Before a device can be produced and used in quantity, however, it must be engineered to such a state that it rarely fails. The road from the research stage to a producible item is a long and rocky one, especially if the use required is for military purposes where dependability is a matter of life and death. In the case of the proximity fuze, the pressure for production was so great that there was no time for the usual production engineering stage in the development process. The device went from research to production immediately and such production engineering as was absolutely unavoidable had

to be carried out during the production process itself. As a result of this situation, the procurement problem undertaken jointly by the Navy, the Army, the Johns Hopkins University, and the Bureau of Standards, and the industrial contractors was far from a routine and boring assignment. The problems were many and varied and were soluble only because all parties concerned, military, industrial, and scientific, were imbued with the feeling of the urgency and importance of the overall job. The assignment proved to be an exercise in tolerance and cooperation for all personnel involved.

The quality control problem itself led to the development of new methods and techniques. The proximity fuze production problem was essentially the same as the production on a tremendous scale of extremely high grade radio sets. There was this important difference, however. For ordinary radio sets the product can be bench tested at very frequent intervals along the production line and a final test made just before shipment. In the case of the proximity fuze the final test could be made only under battle conditions months after manufacture. Even the so-called "proving ground acceptance test," usually considered a good measure of quality, proved to be inadequate since it took no account of the extremely elusive quality of "life" in the delicate electronic equipment involved. Furthermore, even with the most vigorous expediting, proving ground firing tests could only be carried out several days after manufacture, so that at a manufacturing rate of 60,000 units per day hundreds of thousands of defective units might be produced before defects could be uncovered by the usual proving ground tests. It was for this reason that a highly specialized "component quality control" program was instituted which proved to be the secret to the solution of the production problem. Every element in the entire unit had to be designed and manufactured with a margin of safety which would insure operation even after months of rough handling in shipment and use. It was the inherent and unavoidable conflict between the demands for quantity and quality that proved to be, throughout the program, an effective guarantee against boredom. (*Author's abstract.*)

Mr. R. J. SEEGER presented an informal communication in which he described visits with certain German scientists during a recent trip to Germany.

1261st Meeting

The 1261st meeting was held in the Cosmos Club Auditorium, February 16, 1946, President DEFANDORF presiding.

Program: R. D. BENNETT, Naval Ordnance Laboratory: *The future of science under government.*—Both applied and "pure" research have been important in the development of our nation since its beginning. In the past the Government has actively sponsored standardization work such as that of the Bureau of Standards, has carried out research in connection with such general services as weather forecasting, has done research for enterprises where units are necessarily small, as in agriculture, but has supported military research only sporadically. The war created great interest in all research but practically stopped the training of scientists. In the competition for trained men the Government can not meet the offers of industry, can no longer appeal so strongly to patriotism, and can not yet offer security as an alternative inducement. To meet these problems, the Advisory Committee on Scientific Personnel (reporting to the Civil Service Commission) is now studying the problems of the employment of scientists by the Government and is sponsoring part-time graduate study by Government employees in the Washington area with gratifying results. The return to permanent appointments, an increase in maximum salaries, and the partial decentralization of classification and employment procedures are now in sight. It is hoped that the present unflattering opinion American scientists have of government employment will be revised when they better understand the problems, aims, and conditions of government research activities. (*Author's abstract.*)

H. L. CURTIS presented an informal communication on a method of measuring curvature of graphs by comparison with standard curvatures on plastic sheets.

1262d Meeting

The 1262d meeting was held in the Cosmos Club Auditorium, March 2, 1946, President DEFANDORF presiding.

Program: R. M. PAGE, Naval Research Laboratory: *Radar, its past and its future.*

Mr. F. C. BRECKENRIDGE presented an informal communication on *Some questions, pertinent and impertinent, concerning the equivalence of matter and energy.*

1263d Meeting

The 1263d meeting was held in the Cosmos Club Auditorium, March 16, 1946, President DEFANDORF presiding.

Program: W. J. HUMPHREYS: *The Philosophical Society in its youth.*—George Washington, Thomas Jefferson, and other intellectual worthies of their day, men of broad vision and clear outlook, urged that there be founded in the Nation's Capital a comprehensive scientific society for the promotion of useful knowledge and its prompt diffusion to all the world.

They had in mind the incalculable benefits to humanity that, directly and indirectly, continuously were coming from the French Academy, the Royal Society of London, the American Academy of Arts and Sciences, the American Philosophical Society, founded by Franklin, before which at one of its meetings Jefferson founded the American branch of an important science, and at another gave a mathematical paper of the utmost economic value. Let there then, they urged, be such an organization in Washington.

For many years nothing of importance came of these and often repeated similar suggestions and convincing arguments by those who saw the light and wanted to follow it. At last, however, on March 13, 1871, the end they so earnestly desired was attained by the founding of the Washington Philosophical Society, with a creative scholar of all-inclusive scientific interest for its president—Joseph Henry, Secretary of the Smithsonian Institution.

At first the Philosophical Society covered all sciences but provided for the friendly separation of special groups whose interests were more narrowly restricted. Such groups were formed until now there are about a score of them in Washington, each speaking a jargon of its own, but for all that doing much valuable work. In the meantime the parent society continued its unbroken course of growth in membership and increase of importance.

Among the early members of the Society were: Joseph Henry, its first president and a physicist of the highest rank; Simon Newcomb, a mathematical astronomer of world-wide recognition and second to none of his day; Jonathan Homer Lane, who attained scientific immortality by proving that the more heat a star loses the hotter it gets; Alexander Graham Bell, of telephone fame, whose Wednesday evenings at home were memorable occasions to Washington scientists; William Ferrel, who proved that in the Northern Hemisphere air pushed north blows eastward, pushed east blows southward, and so on around the compass; Samuel Pierpont Langley, who with his bolometer pushed our knowledge of the solar spectrum far beyond the limit of vision or range of the photographic plate; and many others, including two of America's most noted scientists, T. C. Mendenhall and C. D. Walcott, each a president of this Society, who never had a day's training at college.

These were only some of the many great scientists who were members of the Philosophical Society—too great ever to act snobbish.

For a long while after the founding of the Society many, if not nearly all, of its more eminent members wore full beards. Why they did so I do not know; perhaps they were frank enough openly to admit that shaving is a nuisance.

For 40 years or so after its founding the meetings of the Society were rather formal and dignified, in keeping with the customs of cultured gentlemen on any important occasion. Always shirt sleeves were out of order, and smoking was strictly taboo, not by virtue of any formal rule or bylaw, but through the then universally recognized courtesy of one gentleman to another. However, the things that more than all others characterized the Society in its early days, and still characterize it, were its desire for useful knowledge and its respect for those who contribute thereto. (*Author's abstract.*)

I. C. GARDNER, National Bureau of Standards: *Scientific and technical development of the German optical industry during the war.*—The speaker presented the results of a three-months' trip to Germany during which the different optical firms were visited and their scientific personnel interviewed. The investigation was made under the sponsorship of Army

Ordnance. After a brief review of the general organization of the optical industry in Germany, the production of optical glass, the methods for producing reduced-reflection coatings, the production of fused quartz of optical quality, the growing of crystals for optical purposes, and the construction of optical instruments were discussed in some detail. Stereopticon slides were presented showing the different types of machines in use in the Zeiss plant. Slides of general interest presenting the conditions of present day Germany were also shown. (*Author's abstract.*)

In an informal communication Mr. W. J. HUMPHREYS suggested that mirages may have given rise to the Biblical report of the parting of the waters of the Red Sea (see Sci. Monthly 63: 82. 1946).

1264th Meeting

The 1264th meeting was held in the Cosmos Club Auditorium, March 30, 1946, President DEFANDORF presiding.

Program: E. K. PLYLER, National Bureau of Standards: *Applications of infra-red spectrometry to chemical analyses and molecular problems.*—On account of the war, infrared work has increased greatly. There have been developed better methods of detecting infrared radiation and instruments are now being made which are almost automatic in operation. A slit control device is described which keeps the total energy practically constant from 3 microns to 14 microns. Results are given for the percent transmission of 20 hydrocarbons. Marked changes produced in the absorption spectra by isomers are well illustrated in this set of spectra. (*Author's abstract.*)

F. WENNER, Department of Terrestrial Magnetism: *Forces between linear circuits according to O'Rahilly.*—This paper was published in this JOURNAL (36: 294–296. 1946).

In an informal communication Mr. K. L. SHERMAN pointed out that the power required to "create" electrons with their rest energy and at a rate which would maintain the Earth's charge was equivalent to the power dissipated in the atmosphere due to the loss of charge from the Earth during fair weather.

1265th Meeting

The 1265th meeting was held in the Cosmos Club Auditorium, April 13, 1946, President DEFANDORF presiding.

Program: F. J. BRADY, National Institute of Health: *Radioactive antimony in medicine.*—Considerable impetus was given to the study of antimony compounds in medicine because of their usefulness in treating two tropical diseases acquired by members of the armed forces. Collaborative work was carried on by four groups within the National Institute of Health, the Carnegie Institution of Washington, and the U. S. Army. Many new compounds were prepared and tested against the dog heartworm, a parasite related to one of man's parasites. All trivalent antimonials tested eliminated the microfilariae from the blood but the adult parasites were rarely killed. Histologic examination of these adults revealed that degenerative changes of the ovaries and uterus had occurred resulting in sterility of the females.

Radioactive isotopes of antimony were prepared for tracer studies. In dogs, it was shown that the blood antimony concentration falls rapidly after administration of the drug, most of the antimony being taken up by the liver. The thyroid and adult parasites also concentrated the antimony. The excretion rate was low, 4 to 21 percent of the antimony being excreted in 36 hours. In white rats the blood-concentration curve showed a secondary rise beginning between four and eight hours and reaching levels never observed in dogs. Human volunteers were treated with radioactive tartar emetic, and the blood concentration was found to be like that of dogs. A mathematical analysis of these data along with excretion rates indicated that a new compound is formed and probably no antimony in the blood and excretions is tartar emetic after six hours. The indications are that this new compound is less toxic than tartar emetic, that it is more readily mobilized and excreted than tartar emetic, and that most of it is produced in the liver. (*Author's abstract.*)

In an informal communication Mr. F. B. SILSBEE showed slides of the characteristic discharge in a positive electric field in air occurring at one end of a wire simultaneously with the discharge in a negative field at the other end.

In response to a written request for information from an unidentified individual, Mr. L. B.

TUCKERMAN presented an informal communication on the concept of a straight line.

1266th Meeting

The 1266th meeting was held in the Cosmos Club Auditorium, April 27, 1946, President DEFANDORF presiding.

Program: W. F. FOSHAG, U. S. National Museum: *The Parícutin volcano's first year.*—The development of Parícutin volcano from the second day of its existence through the destruction of San Juan Parangaricutiro was shown in kodachrome motion pictures. Parícutin Volcano broke out in a cornfield on February 20, 1943, and rapidly grew to a cone 435 meters high. After a two-week period of local earthquakes and subterranean noise a narrow crack appeared in the soil, from which issued a thin column of steam. A few hours later, the volcano threw volcanic bombs over an area of a mile in radius and began to build its cone. The first month's activity was spent largely in the ejecting of bombs and coarse material, later followed by heavy ash falls. The first lava flow began within two days after the volcano's birth. The lava flows are basaltic and very viscous, advancing at a rate of 1 to 30 meters per hour. A subsidiary cone, Zapicho, formed in October 1943 and continued in activity for about 2½ months. The action of the lava flows, lava fountains, fumaroles, hornitos, and other volcanic features as well as the volcano's effects on life in the area were shown. Included were some views of the interior of the crater during eruption and of the destruction of San Juan Parangaricutiro. (*Author's abstract.*)

1267th Meeting

The 1267th meeting was held in the Cosmos Club Auditorium, May 11, 1946, President DEFANDORF presiding.

Program: Four papers on *Interior ballistics measurements.* H. L. CURTIS, National Bureau of Standards: *Method of recording.*—The measurement of a ballistic quantity such as powder pressure, gas temperature, projectile motion, etc., is accomplished by causing it to produce a change in an electric circuit which will deflect the spot of a cathode-ray oscillograph. The deflection is recorded on a rapidly moving film by photographing this oscillograph spot. The velocity of the film is determined from a short square-wave signal introduced in the record of a temperature-compensated tuning fork. The cross hair of the measuring microscope can be accurately set between the two parallel lines of this signal. All events are measured in the same time scale by having on every trace the record of some event, such as the ejection of the projectile. The magnitude of each quantity measured is shown by a deflection, perpendicular to the motion of the film, of the oscillograph spot. If the deflection is proportional to the quantity being measured, the value of the quantity at any instant is obtained from the deflection and the instrumental calibrations. If the deflections occur only when the quantity passes certain values, the record is in the form of a series of steps which give the time at which the value was reached. (*Author's abstract.*)

C. MOON, National Bureau of Standards: *Measurement of pressure.*—The equipment for measuring the pressure of the powder gases consisted of a pressure sensitive element, called a gage, with recording apparatus. The gages were screwed into holes tapped into the gun tube at several positions along the bore. The recording equipment which consisted of a cathode ray oscilloscope with a drum camera was placed in the laboratory and connected to the gage by a 75-foot length of shielded cable. Three different types of gages were used: Piezo-electric, spring, and resistance-strain.

The piezo-electric gages, which were designed by Mr. H. S. Roberts, of the Geophysical Laboratory of the Carnegie Institution, were highly satisfactory. The spring type gage was designed and used by Drs. H. L. Curtis and R. C. Duncan for measuring pressures in 14-inch guns during the first World War. The natural frequency of this gage was too low for use in 3-inch guns.

Two forms of resistance-strain gages were developed; one a tubular type with a bifilar winding of one mil advance wire which was placed on the outside of the tube, the other a piston type with a grid winding on the shank of the piston rod.

Such excellent agreement was obtained between pressure curves from the piezo-electric gages and the resistance gages that after a time resistance gages only were used since they were easier to construct and maintain.

The accuracy of the pressure measurements is difficult to evaluate. The gages are constant over long periods to better than 1 percent. Errors in pressure obtained are introduced by the amplifiers, and other sources, so that the final pressure may be in error by 2 percent. (*Author's abstract.*)

H. S. ROBERTS, Geophysical Laboratory: *Motion of projectile.*—Several methods are available which give a record of displacement versus time as the projectile travels through the gun barrel. The microwave interferometer, developed by Dr. T. H. Johnson at Aberdeen Proving Ground, is perhaps the most satisfactory. A beam of centimeter wavelength electromagnetic radiation is directed across the muzzle from a radiator to an identical receiver. Part of the radiation enters the gun, travels down to the projectile, is reflected by the projectile, and returns to the muzzle where it combines with the direct beam. The resulting signal is recorded by an oscillograph and exhibits a series of maxima and minima which correspond to definite positions of the projectile. The radiation wavelength should be between 35 and 40 percent greater than the diameter of the bore. The talk was illustrated with oscillograms and displacement-time curves obtained with a 3-inch and with a 37-mm gun. (*Author's abstract.*)

F. C. KRACEK, Geophysical Laboratory: *Measurement of gas temperature.*—The gas evolved in the burning of propellants in closed chambers or guns, if it did no work, and if there were no thermal losses, would be produced at the adiabatic temperature T_0 of the particular chemical reaction involved in the burning process. In the actual burning adiabatic conditions are not strictly fulfilled, and hence the temperature of the gas is always lower than the adiabatic. Furthermore, the temperature varies during the expansion when the gas does external work, and in addition, it may be expected to fluctuate owing to ignition and burning irregularities. Since the time of the entire set of events even in large guns is completed in a few milliseconds, it is evident that only a mass-less thermometer could be expected to follow the actual variations of the temperature.

It was found that the temperature could be determined from measurements of the characteristics of the radiation emitted by the gas. At very low gas densities Δ the emitted radiation consists of thermally excited lines and bands descriptive largely of the inorganic constituents of the powder, superimposed upon a weak continuous background. As the density increases the discrete features of the spectrum merge into the increasingly prominent continuum until when the product of $k\Delta l$ exceeds unity, the spectral distribution closely approaches that of a black body at the temperature T of the gas. In the above, l is the length of optical path through the gas, and k is the mass absorption coefficient which was found to be of the order of 30 to 120 cm^2/gm for the types of powder gas studied.

In making the determinations, the radiation was measured through fused quartz windows by photoelectric tubes of selected spectral response, incorporated into suitable circuits for oscillographic recording. The circuits were described, and data given for measurements taken of the gas temperature in closed chamber and gun firings. (*Author's abstract.*)

KENNETH L. SHERMAN, *Recording Secretary*

Obituaries

E. O. Wooton.—In 1890 there was organized at Mesilla Park near Las Cruces, N. Mex., one of the last Land Grant colleges, first called New Mexico College of Agriculture and Mechanic Arts, later New Mexico State College. Today, with so many successful colleges in the Southwest, it is hard to realize the local importance of this new school, which had no competitors within several hundred miles except the University of New Mexico. The almost fanatical eagerness of people of that region, themselves often barely able to read and write, for better education of their children can be realized only by those who know how they often drudged to educate their sons and daughters. One of the members of the first faculty of this college was Elmer Ottis Wooton, then recently graduated from Earlham College.

The new college began with primitive equipment and a heavy teaching load. Professor Wooton's position for years could scarcely be called a chair of botany, but rather demanded a settee to accommodate the varied subjects he taught. From 1890 until 1911 he had charge not only of botanical instruction and of research in the Experiment Station, but was assigned geology and other subjects. He probably was the last survivor of that first faculty, which was joined only a few years later by that versatile and still active scientist T. D. A. Cockerell.

In the summer of 1892 Professor Wooton made a large collection of plants in the White Mountains of New Mexico, then botanically unknown, and sets of them, distributed to most leading herbaria of the world, have become classical. Sale of the collection enabled him to study at Columbia University from 1896 to 1898, and determine his plants at the New York Botanical Graden. There he was associated with N. L. Britton, P. A. Rydberg, J. K. Small, L. M. Underwood, and E. L. Greene, the last engaged in similar studies of southwestern plants, of which he had been a pioneer collector.

It was here that Professor Wooton began systematic work upon the New Mexican flora, interest in which continued the rest of his life. It culminated in the publication in 1915 by the U. S. National Museum of the *Flora of New Mexico*, in whose preparation the present writer, who had been his student and assistant, cooperated. While this is the volume by which he will be remembered, he published also many articles upon New Mexican plants, particularly cacti, native ornamental plants, and grasses.

Returning to New Mexico in 1898, Wooton was professor of botany until 1900, and professor of biology until 1911, and most students of the college from 1890 to 1911 were in his classes. A born teacher, he possessed an extraordinary talent for lucid and practical instruction that held the interest of a student. His influence was not confined to subjects he was scheduled to teach but extended to other branches of knowledge and culture that for him were quite as important as his official subjects. Both Professor Wooton and his wife were intensely interested in music and the cultivation of its appreciation among the student body.

I do not know what botanical experience he had before settling in New Mexico, but once there, the plant life, so unlike that of Indiana, claimed his attention. He spent his vacations traveling and camping with a team and wagon, gaining a more intimate acquaintance with the country than is possible with an automobile. He visited all parts of New Mexico, some of them repeatedly. It was his duty to inspect grazing lands reserved for support of the college, and thus he took a special interest in range problems, which led to his employment for this type of work in the Department of Agriculture, where he continued the rest of his active life. He held various positions in the Office of Farm Management until his retirement in 1935. During his later years he lived at Arlington, Va., with his daughter Esther, after the death of his wife, whom he married soon after his graduation from Earlham. Professor Wooton was born of Quaker stock at Kokomo, Ind., on September 19, 1865, and died on November 20, 1945.

I believe that Professor Wooton in his late years looked back to his early days in what was then truly Wild West as the happiest time of his life. New Mexico, despite some sterner phases, has a peculiar fascination, based upon

its beautiful mountains and plains, its vast vistas, its romantic history, and its varied population, to which many people have succumbed. It is a local saying that whoever lives three years in New Mexico never leaves, or regrets it ever afterward if he does. It was unfortunate that Professor Wooton did leave the teaching profession, for which he was uncommonly qualified; and good teachers are not common. He will be remembered gratefully by the college that he served so long and so loyally; indeed, it expressed appreciation of his services by the honorary degree of doctor of sciences in 1932. Professor Wooton is held today in affectionate remembrance by hundreds of former students and other friends, who will not forget his infinite patience, his kindness, his shrewd advice, his keen interest in scientific progress, and his gentleness except when his sense of justice was violated.

PAUL C. STANDLEY.

EDWARD ALPHONSO GOLDMAN, one of the outstanding American mammalogists, died suddenly in Washington, D. C., on September 2, 1946. He had been associated in biological work for over 51 years with the Biological Survey and its successor, the U. S. Fish and Wildlife Service.

Goldman was born at Mount Carroll, Ill., on July 7, 1873, but spent most of his childhood in Nebraska and California, where his parents had moved seeking better agricultural opportunities. His education consisted of grade and high-school training and later of collegiate courses fitting his particular calling of naturalist.

On March 1, 1892, when only 18 years of age, Goldman hired out as a personal assistant to Edward W. Nelson, who later became chief of the Biological Survey, and together they formed a friendly scientific partnership that lasted more than 40 years, terminated by Dr. Nelson's death in 1934. Indeed, so close was this association that the names Nelson and Goldman were linked almost inseparably, especially when referring to their natural-history work in Mexico. No two scientists knew Mexico better, for together or singly they spent more than 14 years in this republic, crisscrossing it from north to south and from east to west, studying its fauna and flora, and collecting nearly 23,000 mammal specimens, which are now housed in the Biological Surveys collection in the U. S. National Museum. Many of these specimens have through the years become the types of species and subspecies of North American mammals new to science.

During the more than half a century of Goldman's official connection with the Federal service he held many positions: field naturalist of the Biological Survey (1892–1917), chief of its division of biological investigations (1917–1925), chief of its division of game and bird reservations (1925–1928), senior biologist in its division of wildlife research (1928–1940). He served one and one-half years as a sanitary officer with the rank of major with the American Expeditionary Forces in France during World War I, in charge of rodent-control operations. At the close of the war he became a Reserve Major, Sanitary Corps, for the period 1922 to 1937.

Besides his research and administrative work Goldman become a leading authority in wildlife management. He took a very prominent part in this country's negotiations for what finally become a treaty between the United States and Mexico, on February 7, 1936, for the protection of migratory birds and game mammals. In commending Major Goldman for the part he played in the successful conclusion of the treaty, the American Embassy at Mexico City stated that Major Goldman was recognized by the Mexicans as an authority on Mexican fauna and as one who was more familiar with the subject than were the Mexicans themselves.

Although Major Goldman officially retired in December 1944, when he was appointed honorary associate in zoology on the staff of the Smithsonian Institution, he continued with his work and writings to within a few days of his death. He had hoped to complete his *Mammals of Mexico*, on which he had been working for many years; a part of this is planned for publication. His bibliography covers 206 titles, published over a period of 44 years beginning in 1902, mostly in the field of mammalogy. He was author of three numbers of the Biological Survey's North American Fauna series: *Revision of the wood rats of the genus Neotoma* (1910); *Revision of the spiny pocket mice (genera Heteromys and Liomys)*

(1911); and *Rice rats of North America (genus Oryzomys)* (1918). In 1920 the Smithsonian Institution published his *Mammals of Panama*, based on a faunal survey of the Isthmus that he made during the construction of the Panama Canal. He was coauthor, with the undersigned, of *The wolves of North America* (1944) and of *The puma: Mysterious American cat* (1946), both published by the American Wildlife Institute. Though Goldman will always be remembered as one of our greatest authorities on the mammals of North and Middle America, he also excelled in the fields of ornithology and botany. He described well over 300 forms of mammals; and more than 50 birds, mammals, plants, reptiles, and mollusks have been named in his honor.

Major Goldman held membership in the American Association for the Advancement of Science (fellow), the Washington Academy of Sciences, the Biological Society of Washington (past president), the American Ornithologists' Union, the Cosmos Club of Washington, D. C., the Explorers' Club of New York, the Cooper Ornithological Club, the Washington Biologists' Field Club, the Baird Ornithological Club, and the American Society of Mammalogists, of which he became president in April 1946.

Burial with full military honors took place at Arlington National Cemetery on September 6, 1946. Besides his wife, he is survived by three sons, a grandson, and two brothers.

Goldman was a man who will long be remembered for his many human qualities. Modest and unpretentious in all he said and did, he endeared himself to all who knew him. His understanding, generosity, and almost God-like even temperament probably account more than anything else for the fact that so far as known by his associates he never had a single personal enemy.

STANLEY P. YOUNG.